

Graphsoft

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Welcome to MiniCad+ 3.0

This CAD program combines simplicity, intuitiveness, and power in one package. There is no need to purchase any other modules to have 2D and 3D on the same screen. No external database is needed to maintain records for materials and manufacturers. No external spreadsheet program is necessary to compile cost reports and analyses. And, if you wish to customize the program for specific use, programmable macros and command palettes are also included in this package.

There is no other CAD package on the market today which incorporates 2D drafting, 3D wireframe, database generation, worksheet facilities, customized command, and macro programming in one package at a reasonable price.

Welcome to MiniCad+ 3.0.



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Introduction

MiniCad+ is:

Full-featured

MiniCad+ 3.0 is a full-featured Computer Aided Design and Analysis program which runs on the Macintosh Plus and higher. The aim in designing this software is to provide a precise and seamlessly integrated tool that will allow you to increase your productivity at an affordable price.

Integrated CAD

One of the problems MiniCad + set out to solve was time-consuming transfers between products. By having 2D, 3D, a relational database and a spreadsheet in the same window, you can quickly and easily control all aspects of your work, from creative design to precise 3D rendering to cost analysis. You can add or subtract layers and colors, and rotate your drawing for viewing at any angle or perspective, render it in 3D and put it back into 2D. You can change your drawing and get an instant change in cost. The possibilities with such a broad based program are almost endless. And with MiniPascal, our programming language, you can customize your own routines.

High Accuracy

MiniCad+ is a true CAD system where an object's attributes, such as size, are the definition of the object. As a part of its commitment to quality, the program aims at providing the best possible combination of accuracy and speed by offering movable point coordinates. Thus, MiniCad+ maintains speed while providing a coordinate universe of ± 1 billion by 1 billion K. This means MiniCad+ can zoom in or out on an

object 1000 times with no distortion and no rounding errors. You can zoom in to draw a washer on a faucet within an apartment complex you have designed using multiple layers at multiple scales and never have to sacrifice any accuracy whatsoever. You can rotate objects and text by degrees, minutes, and seconds. You can shift a multi-layered drawing with no sacrifice in accuracy.

Reliable

MiniCad+ is reliable software. Graphsoft's experience in providing CAD software for the Macintosh has given it the existing in house technology to develop an exceptionally solid piece of software from the start. With a substantial user base, we had plenty of advice about what to do to create user-friendly software. And we have listened.

Award winner

MiniCad+ has been honored with both the United States and the Australian MacWorld World Class Awards for CAD.

Price Performance

MiniCad+ offers an absolutely unmatched price point. For \$795.00 you get professional-level 2D and 3D CAD, a fully integrated database and spreadsheet, and a programming language along with a built-in DXF translator. Even if you don't need all the power MiniCad+ offers today or even next month, you probably will need it—or find you can use it—before too long. The extra power won't bog you down! And in the meantime you have one of the best CAD products on the market as well as access to our technical support, newsletter, upgrades, and user community.

MiniCad+ introduces the concept of CADA (Computer-Aided Design and Analysis) to midrange CAD. With the database, hot-linked spreadsheet and pro-

programming language, MiniCad+ offers high-powered analysis capability, making the program especially useful for the professional who needs to calculate costs. Further, MiniCad+ 3.0 comes with a relational database that allows you to attach any information you need to objects in your CAD drawing. Using the Worksheet—a spreadsheet and database in one—you can derive and organize information from your drawing to create reports, cost estimates, and bills of material. If your CAD program lacks such an analysis capability, it may not be giving you all the functionality you need.

Smart Cursor

MiniCad+ 3.0 has made drafting easier by introducing the Smart Cursor, an intelligent CAD feature which can be turned on or off. By automatically highlighting and identifying relevant snaps, intersections, tangents, and parallels, the Smart Cursor assists you in creating high-precision drawings with ease.

Flexible

As often as possible, drafting tasks can be done as the user prefers: via keyboard entry of data, menu entry of data or choosing an icon and using the mouse. MiniCad+ has not boiled the program down to the least common denominator, but has built as much flexibility as possible into the software so that you can control your own needs.

Using this tutorial

The rest of the tutorial demonstrates some of MiniCad+'s many features and shows some of the ways you can make MiniCad+ work for you. If you have used a CAD system before, you will quickly realize how easy MiniCad+ is to use and to put to work. In working with MiniCad+, please keep in mind that its capabilities expand as you

gain experience and discover more and more uses for it and more and more features. The tutorial is written for the person who may be new to CAD, but it does presume familiarity with the Macintosh environment. We hope you come away with a taste of MiniCad+'s power and possibilities.

Note: Possibly the best way to familiarize yourself with MiniCad+ is to try out all the palette tools along the side of the drafting area. Clicking on many of the tools shows you alternative modes for those tools (e.g.: constrained line becomes double constrained line, ellipse becomes circle, etc.) Draw a few objects. Select one or two. Then go through the menus and familiarize yourself with the features.

Don't forget...

MiniCad+ 3.0 ships with a built-in DXF translator, encapsulated postscript compatibility with Pagemaker, text that rotates by degree and a constraint palette. Other notable features include hatching, cross-hatching, mirroring, floating palettes, surface sort, and classes.

*"I've looked at a lot of CAD programs and MiniCad+ 3.0 is the most flexible and most configurable...I've seen."
Robert Anderson, Architect and Facilities Manager, as
quoted in MacWeek, June, 1990.*

Tutorial Overview

This tutorial takes you step-by-step through the creation of the floorplan of an office space in 2D, then uses the hotlinked database and worksheet to store and manipulate data about the office and its furnishings. Finally, after an introduction to a variety of 3D tools, the tutorial leads you through extruding, rendering, and setting different perspectives of the 2D office plan. The MiniCad+ documents on the tutorial disk represent the completion of the individual chapters. The first file, "Basic Floorplan" is the drawing that resulted from following the steps outlined in Chapter 1 and may be used to start Chapter 2. The file at the end of Chapter 2 is the result of following the steps outlined in Chapter 2 and may be used to work on Chapter 3. Thus, you may start working with the tutorial in mid-stream by using the pre-created documents.

The files on the Tutorial Disk were saved as templates. When they are opened, they will come up with the name "Untitled." This protects the original files from being edited unless you save the file you are working in with the same name as the template.

The drawing in the tutorial was created to illustrate the tools and commands in the program. It is not meant to be an example of architectural techniques.

Not all the tools and commands available in the program are used in the tutorial. However, as every category of tool and command has been used it will not be difficult to associate the usage of one tool or command with another.

All users of this tutorial are invited to write us with suggestions and comments regarding improving the tutorial as well as with any idiosyncracies they encounter in their use of the program or any inconsistencies between the program's performance and the tutorial. If you have any questions as you work with the program, call Technical Support at (301) 461-9488. The Technical Support department is open 9-5 M-F EST.

Program Disks

The MiniCad+3.0 program comes on two 800K floppy disks. On Program Disk 1 is an Installer program which combines the files on the floppy disks into one application file on a hard drive.

The program does not have any copy protection. The purchase of this product allows the user to run this program on one computer. See the License Agreement for specific details.

Demonstration copies of this program will not Print, Save, or Export files.

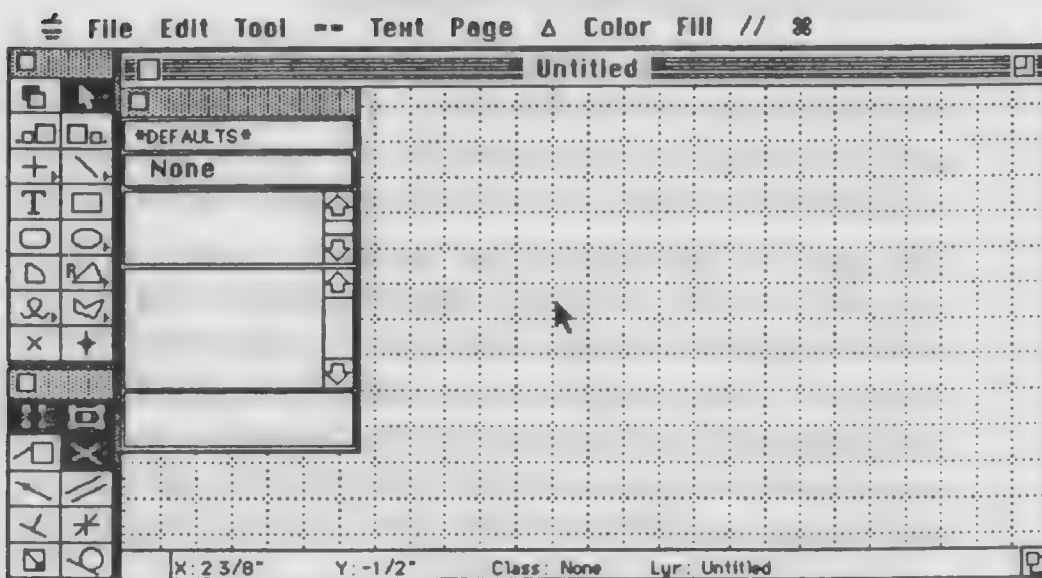
Opening the Program

Open MiniCad+ 3.0 by either:

- Selecting the MiniCad+3.0 icon and selecting "Open" in the File menu of the Macintosh desktop
- Double-clicking on the MiniCad+3.0 icon.

MiniCad+ 3.0 Desktop

When MiniCad+3.0 opens you will see the screen that appears below.



Menu Bar

The MiniCad+ Desktop contains:

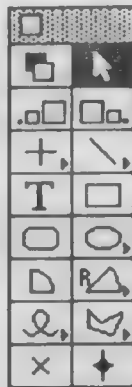
There are eleven menu headers, more than in most programs. To make the Menu bar fit on small Mac screens, a few abbreviated or graphic headers are used.

File Edit Tool == Text Page Δ Color Fill // ⌘

Floating Palettes

Three floating palettes appear on startup:

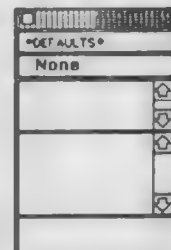
Drawing Tools



Constraint Tools



Data Palette



Data Display Bar

At the bottom of the drawing window there is a text bar which displays data pertinent to the drawing function taking place. The little box at the left end of the bar displays the current fill pattern.

X: -4" Y: 2 3/4" Class: None Lyr: Untitled

Smart Cursor

The cursor icons change to assist the user in selections and drawing.



Chapter 1

Introduction to 2D Design

"We found all aspects of the two-dimensional drafting program to be very functional and almost as comprehensive as the suites of features offered in VersaCAD or AutoCad." MacWeek

"MiniCad+ is a 2D/3D marvel...the look and feel are classic Mac, yet its list of CAD features is impressive." Verbum

"You pick your units, be it architectural, engineering, metric or imperial and a degree of accuracy, up to nine decimal points or seconds of an angle. Then you choose a convenient drawing and reference grid and start your drawing. Any, or all of the above, can be altered at any time..." NCMC Bulletin

Drawing in 2D

This chapter will introduce 2D drafting in MiniCad+ 3.0. As you construct the barebones outline of an office space, you will become acquainted with the 2D drafting environment. This chapter will explore various modes of drawing, including keyboard and dialog box data entry.

You will be introduced to the Smart Cursor and interactive Screen Hints. These help you to draw more precisely by providing text and graphical cues as you move the cursor. The first chapter will also touch on the Constraint Palette tools, showing how you can use the keyboard to turn on and off constraints to drawing tools while in the process of drawing.

Chapter 1 will introduce you to several drawing tools, such as the Double-Line Polygon and Constrained Double-Line, as well as menu commands such as "Join," "Move," and "Duplicate Array." You will create layers of different scales and set layer options which allow snapping through layers.

Once you become familiar with the concepts of this program it will be easy for you to explore other features.

Upcoming chapters will cover other 2D features of MiniCad+ 3.0, such as symbol creation, arcs by radius, and the "Combine Into Surface" command, and introduce some basic concepts of 3D modeling. As you move through the chapters, you'll begin to see some of the ways MiniCad+ 3.0's tools and commands work together to make the process of creating drawings both precise and flexible.

Drawing in 2D

In this section, you'll set-up your drawing area in a one-to-one scale and create a border for your drawing.

Normal Scale

Page	
Normal Scale	⌘3
Fit To Window	⌘4



Selection Pointer

The initial drawing window is in Normal Scale. You are viewing the document at the same size it will print. The entire document may not fit on the screen in Normal Scale when the paper size is larger than the screen.

The cursor in the drawing area is the Selection Pointer. This cursor is used to select menu items and palette tools.

Move the cursor to the Close Box on the Data palette and click the mouse. This will remove the Data palette from the drawing window and give more room for drawing. The Data palette may be placed back on the drawing by selecting it from the Page menu.

Page Menu

Move the cursor to the Page menu and click the mouse button and keep it depressed. The first two items under this menu are "Normal Scale" and "Fit to Window." To the right of these menu items are the key command equivalents for selecting the menu items.

Fit to Window

Select "Fit to Window" (⌘4). When the screen redraws you'll see the entire print area fit inside the drawing window. The print area is defined by a dotted outline.

Creating a Border

In this section you will create a border for your drawing using the rectangle tool. Later, you can go back and add a text and legend box within the border with pertinent information about the drawing. The end of this section will demonstrate how to change line weights.

Rectangle Tool



4

Key Equivalent

Size:

Height:

10"

Width:

7 1/2"

Position:

H:

0'

Point

V:

0'

☐ Next Click

Align Point To:

☐ ☐ ☐

☐ ☒ ☐

☐ ☐ ☐

Cancel

OK

Move the cursor to the Rectangle Tool icon on the Drawing Tools palette and double-click the mouse button to activate the "Create Rectangle" dialog box. Instead of drawing a rectangular border with the mouse, you'll create one with this dialog box.

The key equivalent for the Rectangle Tool is (4). Typing the key equivalent twice in rapid succession is the same as double-clicking on the icon.

When the "Rectangle" dialog box appears, the data input box for "Height:" will be selected. Type "10"" and press the tab key. The "Width:" input box is then selected. Type "7 1/2"". Press the tab key again.

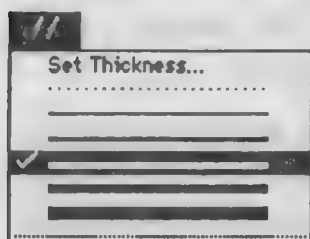
The program accepts feet and inches or whatever units you have set in the "Units" dialog box.

Both "Position:" input boxes have a default of 0'. Coordinate position 0x, 0y, called the Origin, is the center of the initial drawing window. Do not make any changes here.

The "Align Point To" buttons default with the top left button selected. Click the mouse on the center button. The rectangle being created will have its center aligned to 0x, 0y on the screen.

Click the OK button and you will be returned to the drawing window. A rectangle will fill the dotted outline of the print area. The rectangle was drawn in 1:1 scale so it is 10" by 7 1/2" on the screen and fits within the default print area of a 8 1/2" x 11" sheet of paper. (The program defaults to the sheet size of the print driver last selected in the Chooser. For this example a LaserWriter or ImageWriter driver should be selected.)

Line Weights



The default line weight is 1 mil. While the rectangle is selected, click on the Lines menu. The checkmark next to the first solid line indicates that the selected object has this line weight. Select the third line weight.

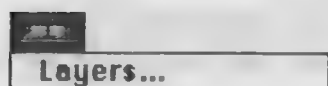
This changes only the selected objects. If no objects were selected and you changed the Line Weight, you would change the default and all future lines would be drawn at the new setting.

Paper Scale: 1:

Creating Exterior Walls

In the following section, you'll create the walls of your office floorplan. Since the floorplan will not fit into the 1:1 scale of the first layer, you will create, name, and scale a second layer into which you can begin drawing.

Layer Dialog Box



Select the "Layers..." menu item under the == menu. A dialog box appears from which all layer attributes are set. The scrolling list on the left of the dialog box shows that there is one layer in the drawing named "Untitled." Since the "Untitled" layer is selected in the list, its name also appears in the "Rename" box.

Type the name "Border" to change the layer name. It appears both in the list and "Rename" box.

Press the "New" button at the bottom right of the dialog box. A new layer named "Untitled" is created. Type the word "Walls" for the new layer's name.

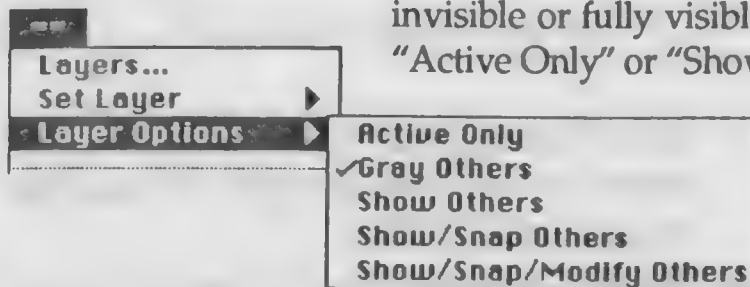
Next click on the "Scale" button. This brings up a new dialog box for setting the paper scale. Click the 1/8" architectural scale but-

- ☐ 1/16"
- ☒ 1/8"
- ☐ 1/4"
- ☐ 1/2"
- ☐ 3/4"

ton to set the scale to 1:96. Do not click on the "All Layers" box. You are only setting this new layer to the new scale. Click the OK button to return to the "Layers Setup" dialog box, then click OK again to return to the drawing.

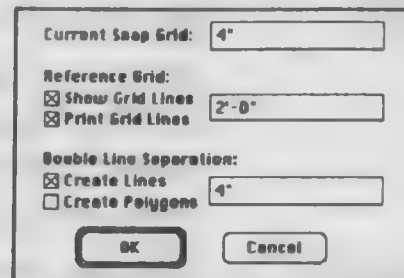
Layer Options

The Data Display Bar now shows that you are in the "Walls" layer. Because MiniCad+ defaults to "Gray Other Layers," the original layer, "Border," is grayed out. As you can see, you can choose to have "Border" made invisible or fully visible by choosing either "Active Only" or "Show Others."



Set Grid

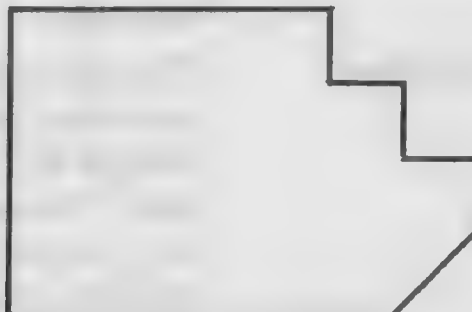
The next step is to set the grids for snapping and reference. You'll also want to set the double-line offset to create the walls. Select "Set Grid" from the Page menu (⌘8).



Type "4'" for "Current Snap Grid," "2'" for "ReferenceGrid," and "4'" for "Double-Line Separation." The "Create Lines" button should have an X in it. Click the OK button.

Building Outline

You'll use the polygon tool to create the double-line outline of the building below.



Normal Scale

Go to "Normal Scale" either by selecting the command from the Page menu or using the key equivalent ($\%3$).

Double-Line Polygon



The Polygon tool in the Drawing Tools palette has three popout choices. The second choice lets you draw double lines. Select it.

Since you selected "Create Lines Only" in the "Set Grid" dialog box, the Double-Line Polygon tool will create lines, not polygons.

Move the cursor to the bottom left of the drawing window, click and hold down the mouse button. Move the mouse upward to start drawing the double-line polygon.

Constrain Angle

R

Key Equivalent

With the mouse button still depressed, type the letter "R". This activates Constrain Angle. R is the key equivalent of selecting the Constrain Angle tool with the mouse.

The Data Display Bar at the bottom of the drawing window will indicate the angle to which the drawing tool is constrained. If A: does not display 90° then move the cursor above the starting point of the polygon until it snaps to 90°. Be sure to keep the mouse button depressed.

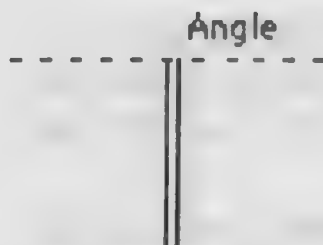
A: 90°

Drawing Double-Lines

⌘
Command Key



Data Display Bar



MiniCad+ allows the user to select which of the two lines to draw with and use to snap to objects. Pressing the Command key while drawing will toggle between four modes of drawing. Press the Command key until the left line of the double lines is below the cursor.

The drawing should look something like the one to the left. The left line below the cursor and the Screen Hint "Angle" tells the user that the drawing tool is constrained to an angle.

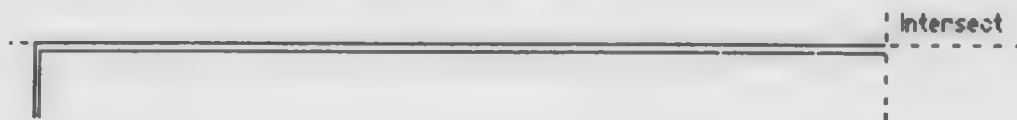
Values for Width (W) and Height (H) can be entered directly into the Data Display Bar while an object is being drawn.

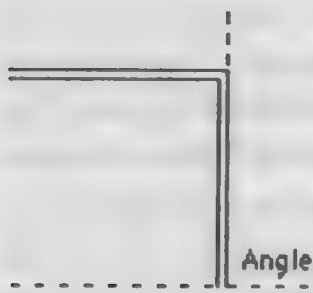
Press the Tab key. This selects the first item in the Data Display Bar (W:). Press the Tab key again to select H:.

Type "36" while H: is selected and press the Return key. This will draw the double lines 36' and snap them to a horizontal dotted line. This dotted line is one of the graphical cues provided by the Smart Cursor.

Move the cursor up to the dotted line and release the mouse to set the first set of double lines.

Start drawing to the right along the dotted line to constrain the drawing angle to 0°, press the Tab key once to select W:, and type "36" and press the Return key. This sends the lines 36' to the right from the first intersection and snaps them to a vertical dotted line.





Move the cursor to the area of Intersect and click the mouse button to set the lines. Start drawing downward along the dotted line and press the Tab key twice to select H:. Type "-8". The minus sign tells the program to draw the lines downward. Move to the Intersect point and click the mouse button to set the lines.

Notice that after drawing the first line segment with the polygon tool, it is not necessary to hold the mouse down to draw the segments. A mouse click sets each segment after the first segment is drawn.

Move the mouse to the right, Tab to W:, type "8", and press the Return key. Move the cursor to the Intersect point and click the mouse to set the lines.

Continue making two more 8' walls, the first to the right and the second downward the same way you made the last two.

The right side of the drawing should look like the picture to the left.

Datum

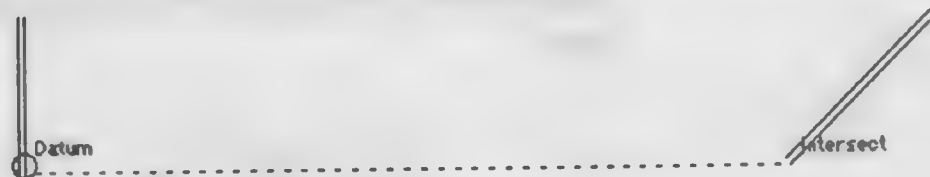
If you look at the outline of the building, you'll see that the next line is at an angle and ends horizontal to the bottom of the left vertical double line created earlier. You are still drawing with the polygon tool.

Turn Constrain Angle off by typing "R" and move the cursor till it touches the bottom endpoint of the left vertical line. This draws an angular set of double-lines from one side of the building to the other. Do not click the mouse. As long as you do not click the mouse the polygon lines remain elastic and may be moved all over the drawing.



By touching the bottom of one of the left vertical lines with the cursor you set that endpoint to be Datum. From Datum you can get a horizontal or vertical dotted line to which you can snap.

Move the cursor back to the right side of the screen and again turn on Constrain Angle by typing "R". When the Data Display Bar indicates that you are constrained to a -135° angle, move the cursor up or down along that angle until you get the dotted lines from the Datum intersecting with the cursor.



The Screen Hint "Intersect" will appear indicating that the double line is snapped horizontally to the Datum. Click the mouse to set the angled lines.

Now complete the outline of the building by moving the cursor to the bottom of the left vertical line and clicking the mouse to close the Double-Line Polygon.

Creating Interior Walls

In the following section, you will construct interior office walls using the double line tool. To make your task easier, you will use constraint tools (snaps), duplication features, the "Move" command and the "Join" command. The first two walls will have a black fill pattern.

Changing Fill Default

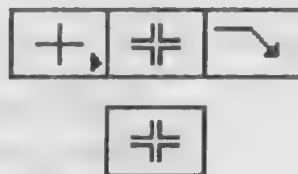
Select Black in the Fill menu with no objects selected on the screen. The Data Display Bar will show Black as the current fill pattern in the box on the left of the bar.

Changing Set Grid

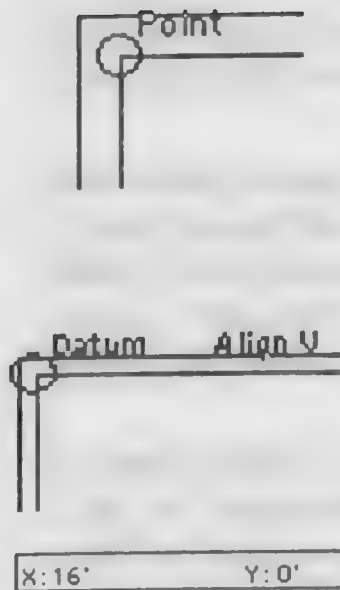
Either select "Set Grid" from the Page menu or use (⌘8). In the Double-Line Separation section of the dialog box click on the "Create Polygons" box. Now all double line tools will create double lines with polygon fills.

Constrained Double-Line

Select the Constrained Double-Line tool. Move the cursor to the upper-left inside corner of the building. The circle with the Screen Hint "Point" appears because both inside walls have an endpoint at this intersection.

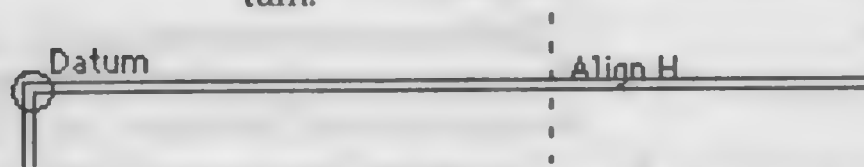


Move the cursor to the right. "Point" changes to "Datum" and "Align V" appears. Datum is a snap point in memory that may be



moved. Press the Tab key, and "X:" in the Data Display Bar becomes selected. Type 16' and press the Return key.

When you first moved the mouse from "Point," "Align V" appeared. After tabbing in the X offset and pressing the Return key, move the mouse slightly. "Align H" appears with a dotted vertical line 16' from the Datum.



Moving the cursor to the intersection of "Align V" and "H" will snap the cursor to the intersection.



Click and start dragging the cursor to the bottom inside wall to create the first interior wall.



Snap to Surface



The left line of the double-lines should be the line you are drawing with. If not, press the Command key until you are drawing properly.

While drawing to the bottom inside wall type the letter "S". This will turn on Snap to Surface. When the cursor snaps to the inside wall surface, the word "Intersect" appears. Release the mouse button to set the double-lines.

Offset Duplication

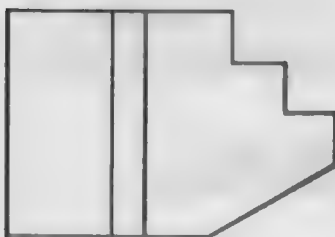
While the double-lines and fill pattern are still selected, select "Preferences" in the Δ menu. Click on the box to the left of "Offset Duplications" to remove the checkmark.

Duplicate

With the objects still selected on screen, select "Duplicate" from the Edit menu. A duplicate of the selected objects is created on top of the originals instead of being offset to the upper right which is the default. The duplicates are now selected.

Move

With the duplicates selected, select "Move" from the Δ menu. Type 5' 4" in the "X offset:" box and click the OK button. The duplicate

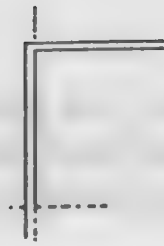


Move Selection		OK
H Offset:	5'-4"	Cancel
Y Offset:	0'	
<input checked="" type="radio"/> Cartesian <input type="radio"/> Polar		

wall with fill pattern is moved to the right with a 5' corridor space between it and the original wall.

To create the first two interior horizontal walls change the "Set Grid" dialog box back to "Create Lines" only. Move the cursor to the corner of the upper left inside walls. When you get the Screen Hint "Point," tab to Y: in the Data Display Bar.

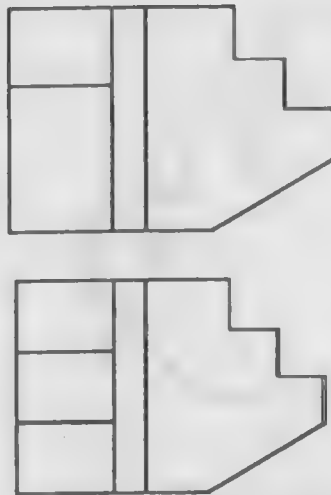




When you get the Screen Hint "Point," tab to Y: in the Data Display Bar.

Type "-11' 6"" in Y:. Move to the intersection and draw to the right, snapping to the inside surface of the first vertical wall. Make sure you are drawing with the top line of the double-line tool.

Duplicate Array



This tool may be used for single arrays as well as multiple. With the double lines just created still selected, hold down the Option key and select "Duplicate Array" from the Edit

Duplicate

Copies:

☐ Rectangular Array
 ☐ Circular Array

Offset

X Offset:

Y Offset:

☐ Next Mouse

Alteration

☐ Resize Duplicate(s)
 ☐ Rotate Duplicate(s)

Cancel

OK

menu (⌘D). Set the number of copies to 1 and the "Y Offset:" in the dialog box to -11' 10". Click OK. When the screen redraws the duplicated lines will be set precisely at the Y offset.

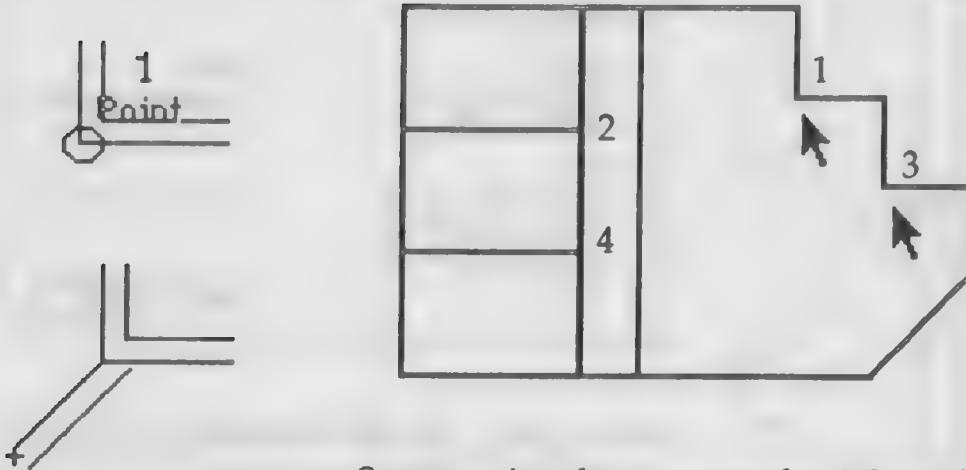
"The arrays are the most powerful of any of the programs tested: not only can they be rectangular or circular, but individual objects can be rotated to any angle as they are copied. Objects can be resized by a specified increment and you can make arrays asymmetrical..." InfoWorld

Tutorial 1.13

In this section you'll finish the basic floorplan by adding some additional interior walls and determining the dimensions of the building.

Use the Double-Line Polygon tool to create the last set of walls.

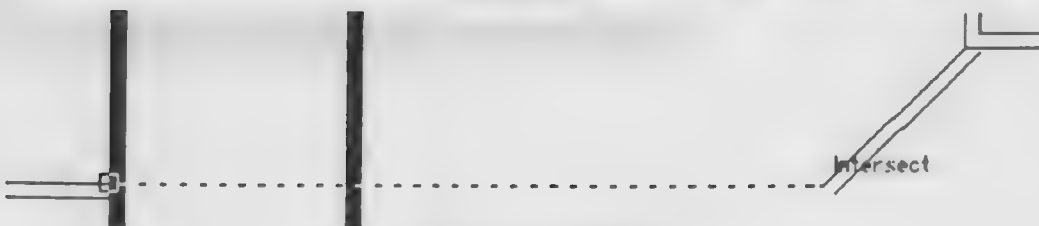
Snap to the inside corner of wall intersection 1. Draw diagonally down to the left, keeping the mouse button depressed and snap to the upper right line at intersection 2.



Start moving the cursor to the right and type

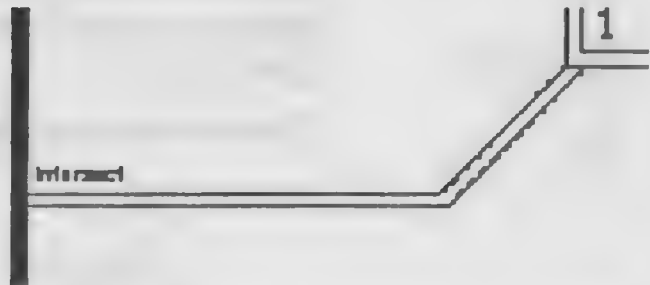
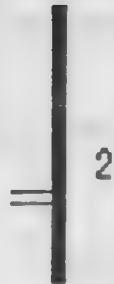


"R" to turn on Constrain Angle. Move the cursor until "A:" in the Data Display Bar displays -135° and you have the Screen Hint "Intersect" indicating you are snapped horizontally to the last snap point. Release the



mouse button to set the first double lines.

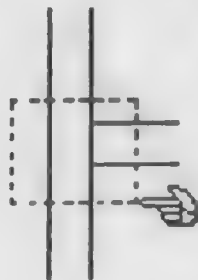
Move the cursor to the left and type both "R" for Constrain Angle and "S" for Snap to Surface. When the Screen Hint "Intersect" appears indicating you are snapped to the first double line you encounter, double-click the mouse to end the polygon.



Option Selection



Marquee



Use the previous instructions to draw the walls from intersection 3 snapping horizontally to intersection 4.

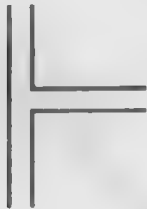
The outside walls were automatically cleaned up by using the polygon tool to create the double lines.

To trim the lines at the intersections of the interior walls, move to one of the intersections of the left vertical wall and an inner wall. Click the mouse in an open area of the drawing to deactivate the drawing cursor and get the Arrow cursor. Typing the letter X (the Arrow cursor's key equivalent) would do the same thing.

Move the Arrow cursor above and to the left of the intersection of the double lines. Hold down the Option key. Click and drag the mouse diagonally to the lower right.

The Arrow cursor changes to the Hand cursor which normally selects all objects within the dotted outline (Marquee). With the

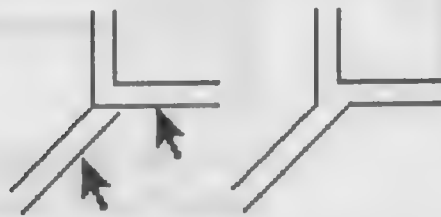
Join



Option key depressed during this operation, all objects intersecting the Marquee are selected. Thus all four lines are selected.

Select "Join" (⌘ J) from the Tool menu. This menu command trims the interior lines of the intersection and removes them. The options that work with "Join" are explained in the User's Guide.

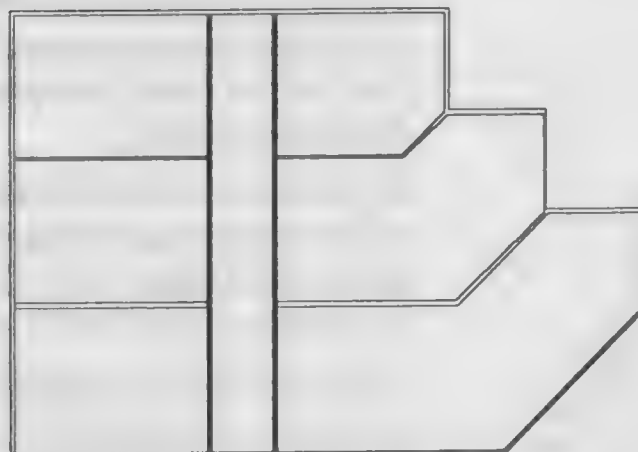
The two interior angular walls will not join in



the above fashion. Select the two bottom walls at the intersection (one angular and one horizontal) and then select "Join."

Select and join all intersections that need it.

The drawing below marks your progress so far. You have created an office on a scaled layer with exterior and interior walls.



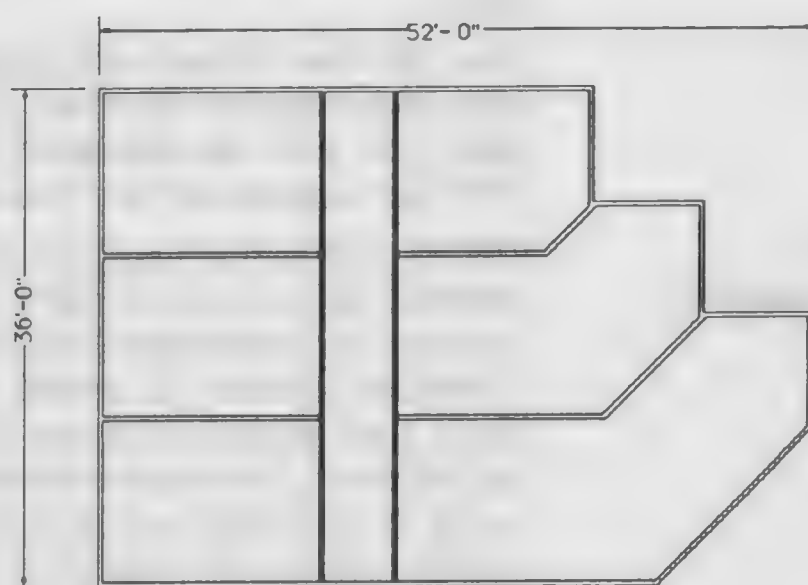
Dimensioning

Now that you have completed your basic floorplan, practice common types of dimensioning by following the directions below.

To get an overall horizontal and vertical dimension you need to group all the lines. Either draw a marquee around the entire drawing or use the command "Select All" under the Edit menu (⌘A). When all the objects are selected, either select "Group" from the == menu or use the key equivalent (⌘G). This gives one set of object handles for the entire floor plan.

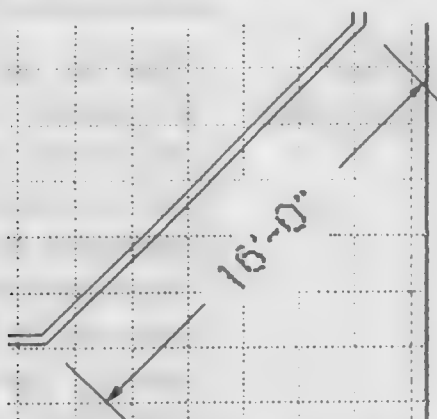
Horizontal and Vertical Dimensions

While the grouped object is selected, select "Dimension H" from the Tool menu. A "Set Dist" cursor appears. Move the cursor the distance above the object that you wish the dimension to appear and click the mouse button. Witness lines and the horizontal dimensions of the floorplan appear on the drawing. Do the same for "Dimension V" moving the "Set Dist" cursor to the left of the object.



Diagonal Dimensions

This tool will dimension the distance between any two mouse clicks. When "Diagonal Dimension" is selected from the Tool menu, a Bullseye cursor appears which is used to click on the two points to be dimensioned. Move to the bottommost diagonal line. With the Snap to Objects constraint activated, the Snap Dot will appear when the Bullseye cursor is snapped to the endpoint of



the line. Click at one end of the line, then the other.

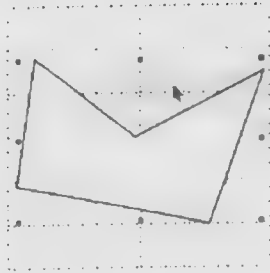
The "Set Dist" cursor will again appear. Move the cursor to the distance from the object you wish the dimension to appear. Click the mouse to set the dimension.

Chain Dimensioning

The "Chain Dimensioning" menu command provides an easy way to place a series of consecutive dimensions onto the drawing at a specified location. To activate this command, hold down the shift key and choose the Tool menu. The first two menu items will switch to horizontal and vertical chain dimension commands. Choose the "Chain Dimension H" item.

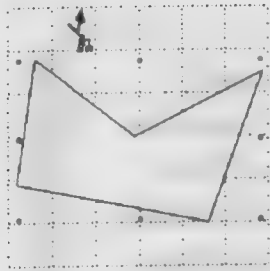
The cursor will switch to the same "Set Dist" cursor used with regular dimensions. Click on the drawing at the location you want the string of dimensions to appear. After clicking, the cursor changes to the bullseye cursor.

The program waits for you to specify which points to include in the chain dimension. Starting at the top left corner of the building, click on the corner points that you want to dimension (see illustration). To end the chain, click on the last point twice or hit command-period(.). Draw a simple polygon like the one illustrated below and follow steps 1-6 to practice chain dimensioning.



1. Select the object(s) to be dimensioned.

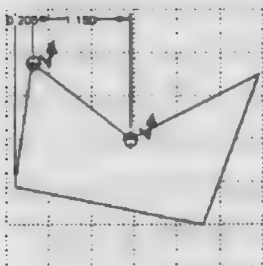
2. Holding down the Shift key, choose "Dimension H" from the Tool menu.



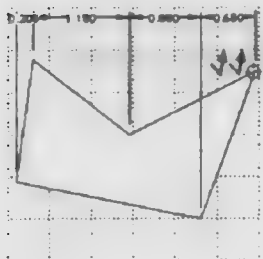
3. The "Set Dist" cursor will appear; click to set the location of the dimension line.



4. The bullseye cursor will appear; click on the first vertex to be dimensioned and the witness line will extend to the dimension line location just determined by the "Set Dist" cursor.



5. Subsequent clicks from vertex to vertex will place partial dimensions along the dimension string.



6. Double click at the last point on the string to end the process.

"One of the program's strongest suits is its comprehensive auto-dimensioning, a task that takes up an enormous amount of time when done manually. At the touch of [a] tool, dimensions can be created in straight, angular, dimensional or chain dimensional styles, and they are resized automatically when the objects are changed...." MacWeek

Chapter 2

Adding Layers and Symbols

"Among the more significant features in the program is the symbol library. Users can place any objects on a MiniCad+ page into the program's symbol library, then move them elsewhere...with a single click. Symbols may contain text; the individual symbols can be edited either on the page or from within the symbol library." Computer Shopper News

"'With the number of symbols in this project, ...it would have been very difficult to remember symbol names, and even a graphic list would have been cumbersome,' Kiss says. 'That's why I'm glad MiniCad+ also provides a hierarchical graphic symbol library. This library organized the symbols in Macintosh-style folders that greatly simplified the symbol selection process. For example, to find a certain door, we would first go to the door folder, then select the single door folder and finally choose plan views.'" Architectural and Engineering Systems (AES).

Another Option:
From "Solar Designs on the Mac," AES: "On the reflected ceiling plans, we ... wanted to show the walls but not doors and windows," says [Greg] Kiss. 'With conventional CAD packages, this is usually [done] by putting doors and windows in a separate layer. To position them accurately, the user has to jump back and forth between layers. With MiniCad+, we put the doors and windows in a separate class called 'plan elements.' Any class can easily be made invisible ...'"

Gray Others

Show Others

Adding Symbols

In this chapter you'll add three new layers to the drawing. The first layer will be for doors and windows. You'll learn how to create and edit symbols, and how to best use MiniCad+ 3.0's sophisticated symbol manipulation and integration features. The second layer will be for text—you'll learn to use the text tool to label different elements in your drawing. The third layer will be for furniture. You'll see how the fully furnished office will look while you learn how to import symbols from other symbol libraries.

Creating and Placing a Door

In this section, you'll create a new layer, then use the Rectangle and Full Arc tools to create a door. The Smart Cursor's screen hints, object rotation and the snap-drag function of the constraint palette will help precisely place the door.

Select the "Layers..." menu item in the == menu and create a new layer entitled "Doors & Windows." The scale should remain 1 : 96.

The other layers are grayed out because the default in "Layer Options" is set to "Gray Others."

Selecting "Show Others" from the "Layer Options" will display the layers as they were created in the "Layers Setup" dialog box. Invisible layers can not be seen and grayed layers will display as gray out-lines. Though you can see the layers, you still can only work in the active layer.

Show / Snap Others

"Show / Snap Others" allows you to snap to objects in layers of the same scale without changing any objects in those layers. This is the selection you want for this section of the tutorial.

Object Handles

The selection handles appear as little black boxes when the selected object is on the active layer. Objects on other layers will display hollow boxes when they are selected.

Creating Doors and Windows



Door Frame

Depending upon the size of your monitor, you'll need to zoom in and out while working in this section of the manual to display objects or parts of objects.

Change the Fill pattern default to White.

Draw a rectangle: Height 6", Width 3".

Duplicate it upon itself.

Move the duplicate X 4' 3"

The distance from the outside of one rectangle to the outside of the other is 4' 6".

Next Click

Using the "Create Rectangle" dialog box, create a rectangle 2' high and 2 1/2" wide. Click the "Next Click" button and the bottom left "Align To:" button. Click OK.

Create Box

Size:

Height: 2'-0"

Width: 2 1/2"

Position:

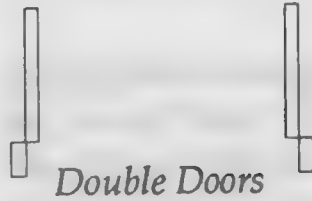
H:

Point Y:

Align Point To: ☐ ☐ ☐

☒ Next Click ☐ ☐ ☐

Cancel OK



Arc by Radius

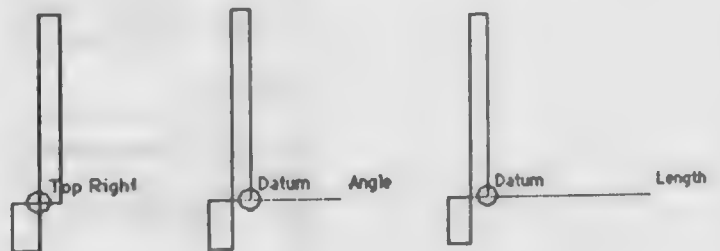


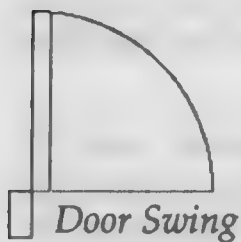
When returned to the drawing, move the cursor to the top right of the left rectangle on the screen. When the circle appears with the screen hint "Top Right," click the mouse button.

Bring up the "Create Rectangle" dialog box again. This time click the lower right "Align To:" button. Leave the rest of the data the same as the last time you used the dialog box. Click OK. When the screen redraws, place the new rectangle at the top left of the other rectangle.

Select the Full Arc by Radius icon in the Drawing Tool palette. This arc is drawn by clicking and dragging the cursor with the mouse button depressed to draw the radius. Releasing the mouse button sets the length of the radius. Moving the cursor after releasing the mouse button draws the arc sweep. Click the mouse button to set the arc angle.

Move the cursor to the intersection of the two rectangles on the left. Click the mouse button and start drawing the radius of the arc to the right. The screen hints "Datum" and "Angle" will appear. With the mouse button still held down, press the Tab key three times to select L: in the Data Display Bar. Type "2'" and press the Return key. This sets the radius to 2'.

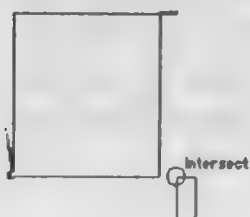
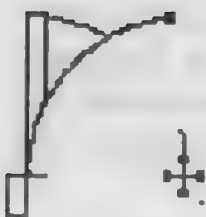




Rotate: Flip Horizontal

Rotate...
Rotate On Screen
Rotate Left 90° %L
Rotate Right 90°
Flip Horizontal
Flip Vertical

Snap Drag



Release the mouse button to complete the arc by moving the mouse upward. When the snap dot appears showing you're snapped to the top of the rectangle, click the mouse button to set the arc.

Select the arc and duplicate it upon itself. With the duplicate selected, Select "Rotate: Flip Horizontal" in the Δ menu. The selected arc will flip 180° on a horizontal plane. The pivot of the door swing for the second arc is now on the right instead of the left.

One of the Smart Cursor icons is the Snap Drag icon. This icon is available when Snap to Objects is selected in the Constraint palette. The Snap Drag icon appears when the cursor is on a snap point of an object. The icon indicates that if the mouse is clicked and dragged, the object will follow and the chosen snap point of the object will snap to any other object's snap points.

Move the cursor to the flipped arc's radius point. When the cursor changes to the Snap Drag cursor, click the mouse button and hold it down. Moving the mouse around you'll see a rectangular outline of the arc follow the mouse movement.

Move the Snap Drag cursor to the intersection point of the two rectangles on the right. When the circle appears indicating you're snapped to the intersection, release the mouse button. The arc's radius point is now snapped to the intersection of the rectangles completing the double door graphic.



The Door as Symbol

In this section, you'll turn the door you have just created into a symbol, place it, and rotate it.

Creating Symbols



Objects that are used several times in drawings and from drawing to drawing should be converted into symbols. The advantages are:

- Easy access to libraries
- Placement by exact points
- Symbol instances take up less memory

To place the double door in a symbol library:

- Select all components of the door.
- Select "Create Symbol..." from the == menu.

1. Enter Symbol Name:

Door, double 54

2. Create symbol with insertion point at:

Object Center

or

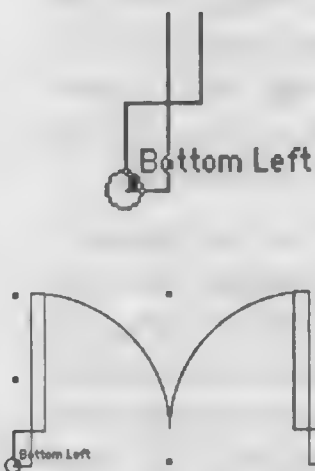
Next Mouse Click

Cancel

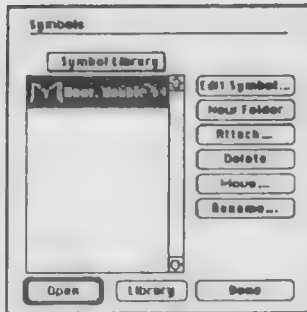
Here you give the symbol a name and click one of three buttons.

Click the "Next Mouse Click" button. When you're returned to the drawing, the program waits for you to click the mouse to set the insertion point of the symbol.

Move the cursor to the bottom left of the doors to get a snap point and Datum. Tab to Y: and type "1'", then press the Return key. Click the mouse button to set the insertion point which is 1" above the bottom left corner.



Symbol Library

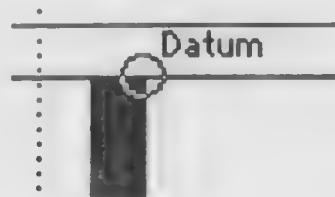


Symbol Insertion

By either double-clicking on the Symbol Insertion tool or selecting "Select Symbol..." from the == menu, you open the Symbol Library. Here is where you select the symbol to place in the drawing. Select the double door symbol and click the "Done" button.

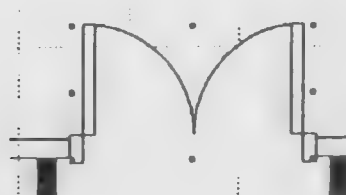
You created the symbol to be 4'6" in width. The corridor between the dark walls is 5'. To center the door you need to move the cursor X 3" from the inside wall for exact placement.

With the Symbol Insertion tool selected, move the cursor to the top right inside corner of the left filled wall to get "Datum."



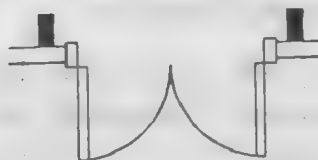
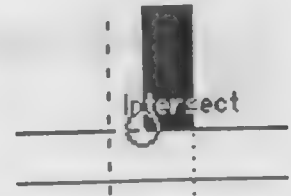
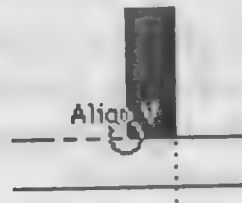
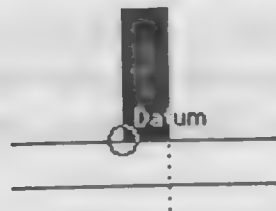
Tab to X: in the Data Display Bar and type "3'" and press the Return key. Move the mouse slightly to get the dotted vertical line 3" from the wall. Move the cursor to the intersection of the dotted line and the inside wall and click the mouse to insert the symbol.

To place the same symbol at the opposite wall, the symbol needs to be rotated during insertion. Remember, the symbol was created to be inserted from the inside wall.



Rotating Symbol Insertion

Move the cursor to the right inside corner of the bottom wall. When the circle with the word "Datum" appears, move the cursor slightly to the left to get Align V. Tab to select X: in the Data Display Bar. After X: is selected, type "-3"" and press the Return key. Again move the cursor slightly to get the dotted intersect lines to appear. This time when you click the mouse to place the symbol, do not release the mouse button. The symbol is being inserted exactly as the other was placed so you need to rotate the symbol 180°.



When the mouse was clicked to place the symbol, A: in the Data Display Bar reads 0°. Move the mouse counter-clockwise and you will see an outline of the symbol being rotated counter-clockwise. When A: equals 180° release the mouse.

The symbol is exactly 3" from the corridor walls and the door opens to the outside.

Importing Symbols

In this section, you'll access another MiniCad+ document's symbol library to obtain needed symbols. You'll note that you do not have to leave your file to access other libraries. You'll import a door symbol, which will come in at the appropriate scale, then edit it using MiniCad+'s "Enter Group" and "Exit Group" commands. Finally, you'll import and insert a window symbol.

Traversing Symbol Libraries

Open the "Symbol Library" dialog box by either double-clicking on the Symbol Insertion tool or typing the (=) key twice in rapid succession.

Searching for Other Libraries

Library

Click on the "Library" button at the bottom of the dialog box. If another MiniCad+ 3.0 file is open, its library will appear in the dialog box. When the program cannot find an open file or you have already traversed the open files by clicking the "Library" button, a search dialog will appear.

Opening Other Libraries

From this dialog box you may scan any volume available and search for MiniCad+ 3.0 files. Look for the file "Tut - 2D Symbols" which is on the Tutorial disk. Double click on the file and that file's library will appear in the "Symbol Library" dialog box.

Importing a Symbol

Double-click on the "Door, 36"" symbol. You're returned to the drawing mode, with the Symbol Insertion tool selected. The symbol "Door, 36" " has been placed into your current library and is selected, waiting for you to click the mouse to insert the symbol in your drawing.

Imported Symbols

The file "Tut - 2D Symbols" is in 1:24 scale. The symbol automatically scales to the scale of the layer into which it is inserted.

The insertion point of the symbol may not be known to you. After placing the symbol on the drawing, you may wish to edit it.

Editing Symbols

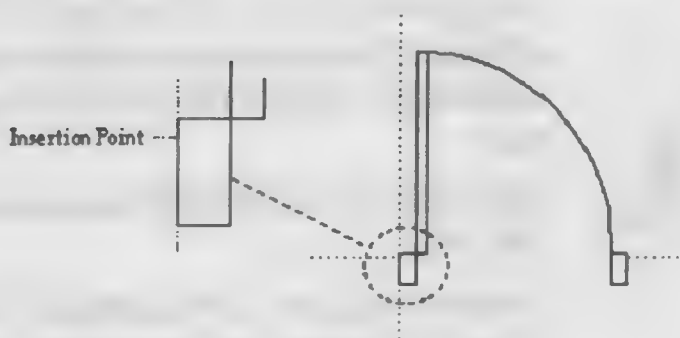
Click the mouse to place the symbol on the screen. With the symbol selected, select "Enter Group" from the == menu.

Enter Group

This menu selection has three uses:

- Enter a group of objects and edit them.
- Open a symbol to work on its individual parts.
- Bring up the 2D primitives of 3D objects for editing.

The symbol being edited is slightly off the center of the screen. The intersection of the full screen dotted crosshair is the insertion point of the symbol. Looking closely you see that the insertion point is 1" in from the inside door frame. This symbol was created to be placed flush with the surface of walls.



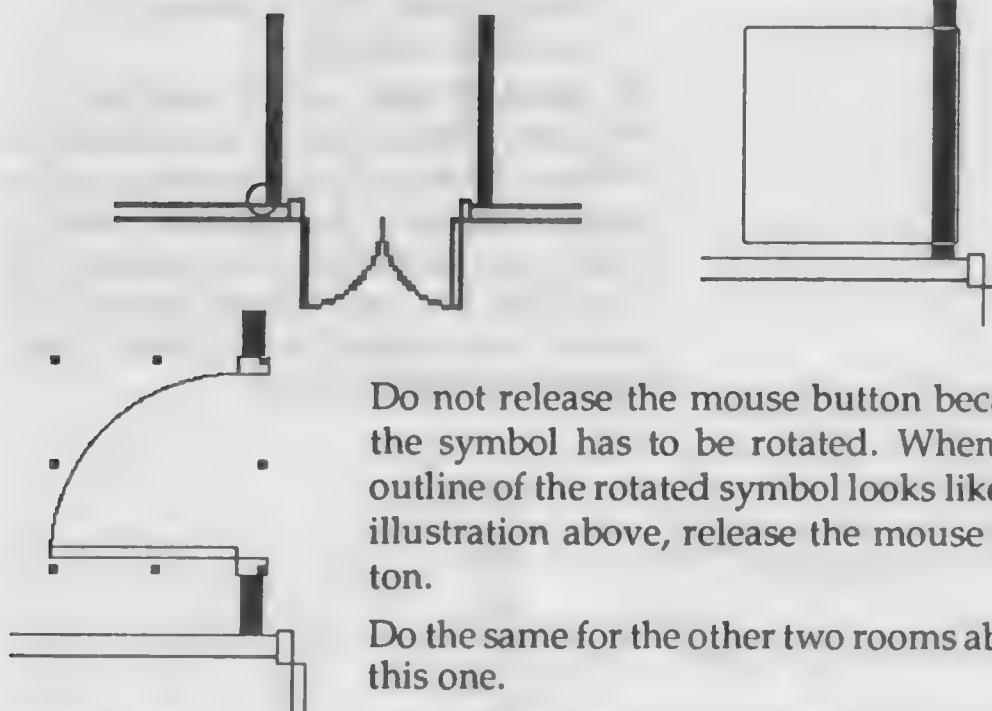
Exit Group

Since this is sufficient for your needs, you will not change it. Select "Exit Group" to close the edit window and return to the drawing.

Inserting the Symbol

Zoom into the drawing at the bottom left of the corridor. With the Symbol Insertion tool selected, move the cursor to the intersection of the corridor wall and the inside wall of the lower left room.

Move the cursors lightly from the point. Tab twice to get Y: and type "3'". Move the cursor slightly to get the dotted intersection lines and click the mouse to insert the symbol.



Rotate: Flip Vertical

Do not release the mouse button because the symbol has to be rotated. When the outline of the rotated symbol looks like the illustration above, release the mouse button.

Do the same for the other two rooms above this one.

On the right side of the corridor Tab Y: 45" from the bottom walls of each room and rotate the symbol to open into the rooms. Then select "Rotate: Flip Vertical." The door will be directly across the corridor from the others.

Window Symbol

Select the window symbol from the "2D Symbol" file. This symbol was created so the insertion point is flush with the wall. For simplicity, place one window centered on each room's exterior walls for a total of thirteen windows. Take a look at the last page in this chapter to see the placement of the windows.



Moving Layers

Completing the Offices

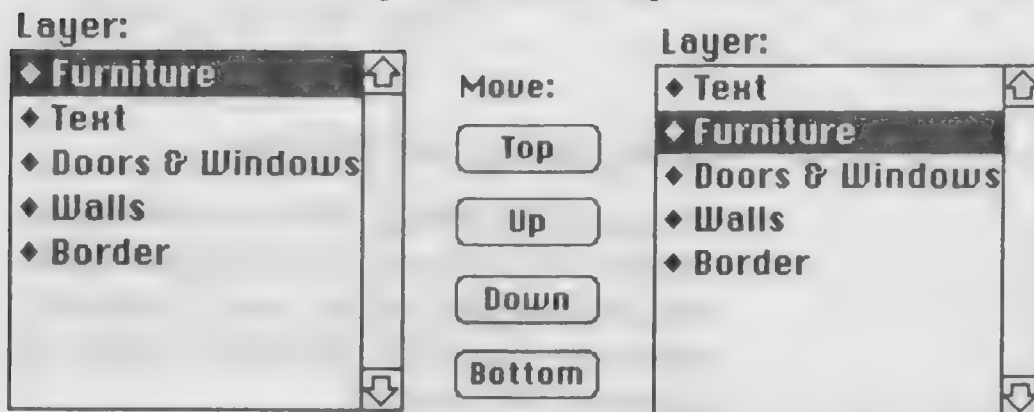
In this section you'll add two more layers: one for text and one for furniture. After adding text, you'll then move layers and place the furniture symbols needed to complete the rooms.

The rooms need to be numbered so you have a reference as to what goes where. Create a new layer named "Text." "Layer Options" should remain "Show / Snap Others."

Set the text size in the Text menu to 6 points. Select the Text tool (T) in the Drawing Tool palette. Move the cursor to the lower left room and click the mouse button. The blinking cursor will appear. Type "Room 101." Move the cursor to the room on the right and click the mouse button to set the blinking text cursor. Type "Room 102." Number the rest of the rooms in succession, the odd numbers on the left.

Create a new layer entitled "Furniture." The new layer "Furniture" is selected in the layers list. Click the "Down" button under "Move."

The new listing shows "Furniture" as the second from the top. The moving of layers determines how they display and print. For example, if the border in the



bottom layer had a white fill and was on top you could not see the other layers nor would they print.

The file "Tut - 2D Symbols" has several more symbols. For practice you can insert them into this drawing with the specifications below. The file "2D Basics 2" already has these symbols inserted.

Room 101

- 2 File Cabinets
- 1 Desk/Chair Set
- 1 Computer

Room 102

- 2 File Cabinets
- 1 Worktable
- 2 Chairs
- 1 Conference Table Set

Room 103

- 4 File Cabinets
- 1 Table

Room 104

- 3 File Cabinets
- 2 Desk/Chair Sets
- 2 Computers

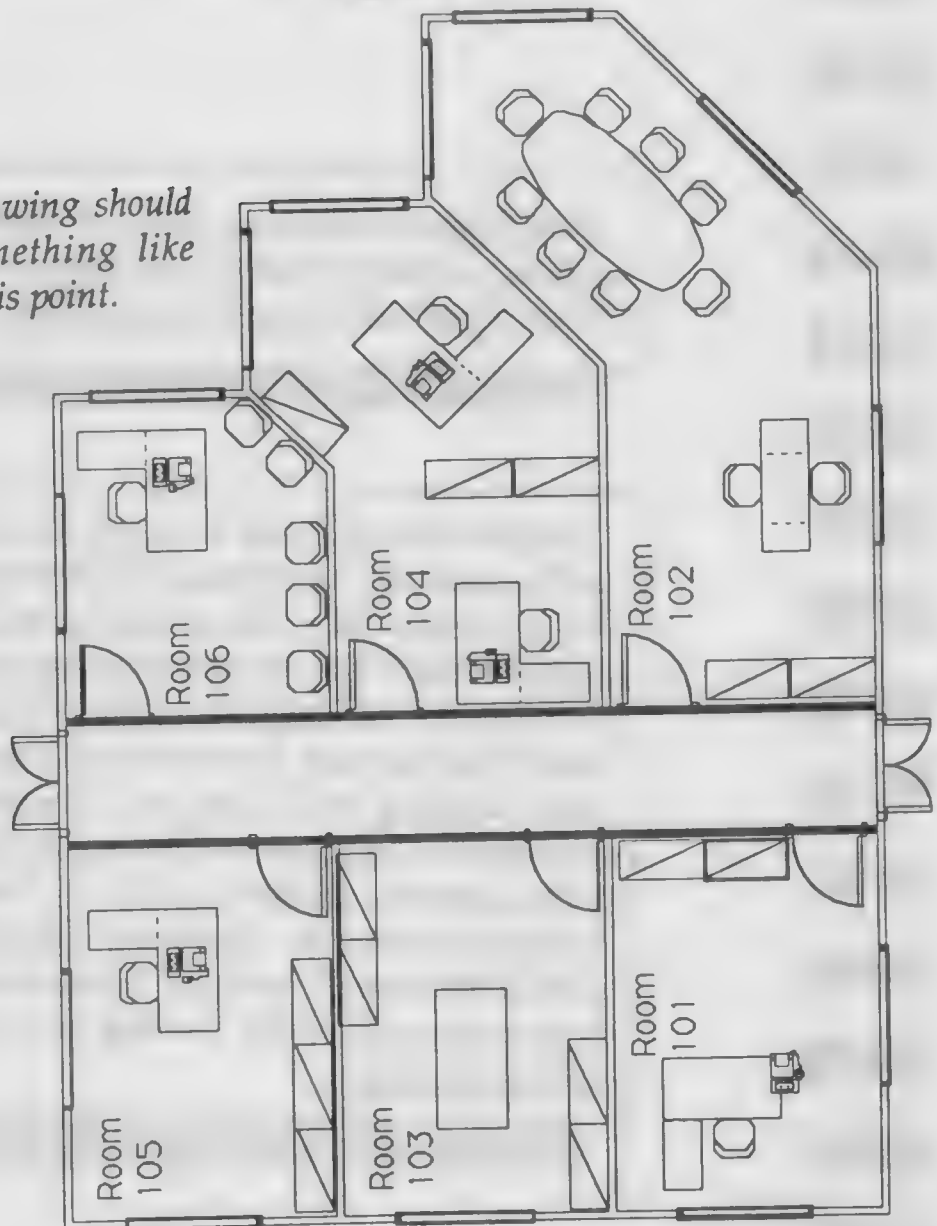
Room 105

- 3 File Cabinets
- 1 Desk/Chair Set
- 1 Computer

Room 106

- 1 Desk/Chair Set
- 1 Computer
- 5 Chairs

Your drawing should look something like this at this point.



Chapter 3

Using the Data Palette and Worksheet: I

*"[The program's database function] offers a greatly expanded reporting capability that is extremely useful."
Robert Anderson, as quoted in MacWeek.*

*"Schlafer said that he did the design work for the subsystem, as well as produced a complete set of 125 working drawings for the project in MiniCad+. The manufacturing drawings include the printed circuit board layout and a microwave microstrip printed circuit...An...advantage cited by Schlafer is the exceptional speed of the program. He said that he recently produced a 1000 object drawing which took only 5 seconds to redraw on a Macintosh II. Furthermore, this speed makes it practical to use on less expensive platforms such as the Macintosh SE and Plus. This makes it possible...to take one of these smaller machines and work at home when necessary. He mentions that the program's large zoom range makes working on small screen tolerable."
MFOC Newsletter*

Using the Worksheet

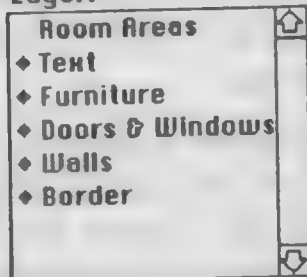
In this chapter you'll learn the basics of using MiniCad+ 3.0's databasing and spreadsheet capabilities. You'll create a new layer to help find room areas, then use the drawing information contained in that layer to generate room areas for each of the offices in the drawing.

Preparing to Create a Database

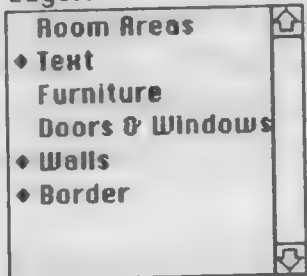
In section one you'll create a new layer as a prelude to setting up a database. In this first section you'll also use "Combine into Surface" to turn offices comprised of lines into offices that are fillable objects with area attributes. In the process of making these adaptations to your drawing, you'll use tools that make maneuvering around the drawing area easier.

Layer Visibility

Layer:



Layer:



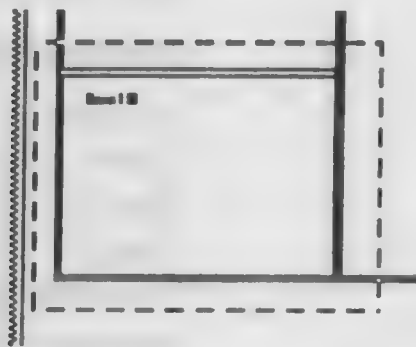
Check the "Layer Options" in the == menu and make sure "Show/Snap Others" is selected. Select Layers from the == menu.

Create a new layer named "Room Areas." Click the "Invisible" button. Check to make sure the new layer is set to a 1:96 scale. Note that it has no diamond marker to its left in the layer listing. When a layer is set to be Invisible, it can only be seen when you make it the Active layer.

Select layer "Furniture" in the layer listing and click the "Invisible" button. Do the same for layer "Doors & Windows." Click the OK button to return to the drawing. Looking at the Data Display Bar you see you are in the "Room Areas" layer and with "Text," "Walls," and "Border" layers visible.

Zoom In

Select the Zoom In icon in the Drawing Tools palette. Move the cursor to the drawing and draw a Marquee around Room 101. This will zoom into the area so it fills the screen.



Hold down the Shift key and select the lines that make up the interior walls of Room 101. When all four lines are selected, select "Combine Into Surface" in the Tool menu and then click the mouse inside the room area. This creates a polygon from the lines and places the polygon on the Active layer, "Room Areas."

Moving Around the Screen

The first three rooms are basically the same size so using the Pan Tool in the Drawing Tool palette along with the Arrow keys should allow you to position the rooms on the screen with the same zoom factor.

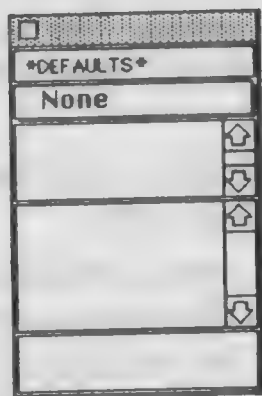
Arrow Keys

The normal function of the Arrow keys is to move the drawing by one half the screen in the direction of the arrow. While in Room 101, press the up arrow key to move you upward into Room 103.

Pan

You may not have moved up far enough to place all of Room 103 onto the screen. Hitting the arrow key again may move you too far. Select the Pan tool from the Drawing Tool palette, and move the cursor onto the drawing window. The cursor changes to a Hand cursor. Click the mouse and

Zooming In and Out



while the button is depressed, drag the mouse downward. Releasing the mouse button causes a screen redraw. If you didn't move the drawing enough or perhaps too much, use Pan again.

When you are able to select the interior walls of Room 103, do a "Combine Into Surface." Then do the same for Room 105.

The three rooms on the left of the corridor probably won't fit in the drawing window with the present zoom factor. Select Fit to Window (⌘4), select the Zoom In icon, and draw a marquee around Room 106.

Select the interior walls of Room 106 then do a "Combine Into Surface." Do the same for the last two rooms.

Introduction to the Data palette: Naming Rooms

In the next section of this chapter, you'll be using the Data palette, one of MiniCad+'s most important new features. Using the Data palette, you can give a name to an object, place objects into classes, and assign records to objects. These records can then be displayed and edited in the Data palette from the drawing window. For example, a window symbol could be given a name, placed into a class, and assigned records.

A record may be formatted with fields whose values range from the manufacturer, model name, price, part number, and so forth. All the information will be displayed in the drawing area, via the Data palette, and can be referred to at any time. In this way MiniCad+ provides

more, for example, than just a representation of a window symbol—you also have important data about the window symbol that will travel with it as attributes. The symbol can be pasted into another MiniCad+ document and all the information that has been assigned to it will show up in the Data palette.

In the following example, you'll enter the names of the rooms you have drawn into the Data palette. This naming provides linkage between the Data palette and the graphical object in question.

If you removed the Data palette from the drawing window by clicking in its Close box, it may be brought back to the screen by selecting it from the Page menu. The top box in the Data palette is for Object Names.

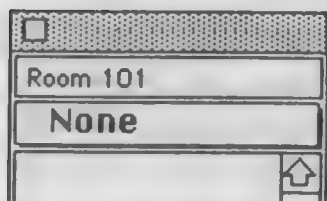
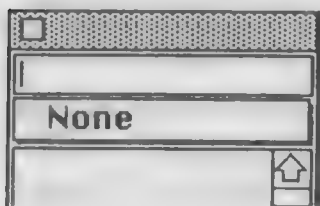
Select "Active Only" from the "Layer Options" popup in the == menu. This way you only see the objects in the "Room Areas" layer.

An object may be given a name. Any name may only be used once in the file.

Select the polygon you created from the inner walls of Room 101. Move the cursor to the Data palette Name Box and click the mouse in the box. A blinking cursor will appear in the Name Box indicating that any typing will be placed into the box.

Type "Room 101." Select the second polygon you made. Again move the cursor to the Name Box and click the mouse. Type

Naming Objects



"Room 103." Do this for each room. To change the name of an object, select the object. Its name appears in the Name Box. Click in the box to get the blinking cursor and edit the name. The Name Box is active until the mouse is clicked elsewhere.

Creating a Class for Rooms

Now that you have entered the names of the rooms into the Data palette, you'll assign these rooms to a class. The ability to assign classes to objects is another important feature in MiniCad+. By assigning objects to a class, you can isolate a group of items so that you may work with them alone.

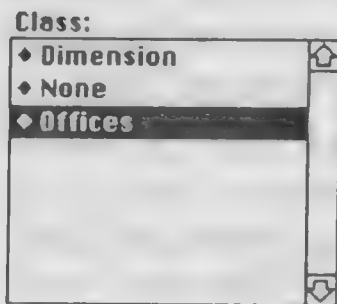
Below the Name Box is the Class Assignment Box. The default class for a new file is "None." All objects are placed into class "None" when drawn until another class is assigned to be the default class.

Select "Classes..." from the == menu. Click the "New" button. In the dialog box that appears type "Offices" and click the OK button.

The new class will appear in the class list in the "Class Setup" dialog box. Click the OK button to return to the drawing.

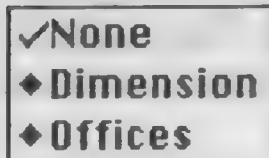
You want to assign all the objects in the "Room Areas" layer to the new class so that you can work with them as a whole when you use the worksheet. Since "Active Only" is selected from the "Layer Options," only the objects on this layer can be selected. Use the "Select All" (%A) command in the Edit menu.

Creating Classes



Select All

Assigning Classes



Move the cursor to the Assign Class Box in the Data palette. Click and hold the mouse down to get a popup of all the classes in the class list. Slide the cursor down to "Offices" and release the mouse button. All the objects in the layer have been assigned to the class "Offices."

The checkmark next to "None" in the popup indicates that it is the default class.

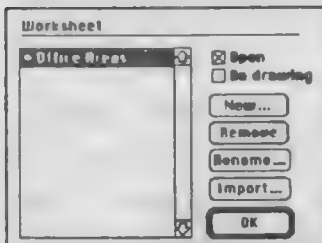
Deriving Office Areas

In the next section, you'll learn how to set up a worksheet and use it to access the class "Offices" that you recently created. Data about the offices will be entered into the worksheet and you'll be able to derive a total area for all the office space included in the "Offices" class.

Select Worksheet from the Command menu (⌘). The "Worksheet" dialog box that appears is used to control all worksheets in the drawing. Click the "New" button.

The next dialog box requires you to type a name for the worksheet palette and determine its size. Type "Office Areas" and click the OK button.

The "Worksheet" dialog box reappears with the new worksheet palette listed. The "Open" button is checked indicating the palette is open on the drawing. Click the



Office Areas		
	A	B
1		
2		
3		

Worksheet Rows

Spreadsheet Row

Spreadsheet Database
Set Criteria...
Edit Criteria
Select Data Items

OK button in this dialog box to return to the drawing.

The worksheet rows are numbered from 1 to the size the worksheet is created. Rows can be designated as either spreadsheet or database rows. The arrows to the right indicate that clicking the mouse when the cursor is here will bring up a popup selection.

Click on Worksheet Row 1. Note that "Spreadsheet" is the default in the popup menu. Release the mouse button while it is selected.

A spreadsheet row may be used for text or formulas. The formulas will give an accumulative total. Cell A1 is selected. Above the drawing window is the Formula Edit Bar for the worksheet. At the left end of the

A1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
----	-------------------------------------	-------------------------------------

bar, the number of the selected cell appears. Any typing on the keyboard when a cell is active will be placed into the Formula Edit Bar.

Select an Inquiry Function:

- acos
- Angle
- Area
- asin
- atan
- average
- BotBound

Done

Cancel

A1	=Area()
----	---------

Search Criteria:

☒ **Preset:**

☒ Visible

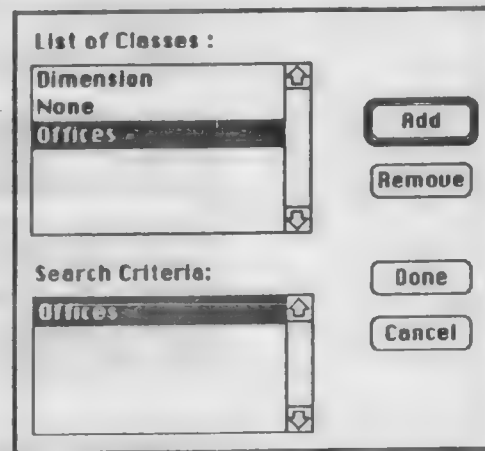
☐ Selected

☐ AN

☐ **Edit:**

Buttons in the dialog include: Layer, Class, Type, Name, Symbol, Rec/Eid, FillPat, LineWgt, ArwHead, LineStyl, FillFore, FillBack, PenFore, and PenBack.

"Offices" in the top window of the dialog box and click the "Add" button once. The added classes are placed into the Search Criteria window at the bottom. Since you



only want to search on class "Offices," click the "Done" button. The program returns us to the previous dialog box from which you may select other criteria to search on. The criteria already selected is in the

(C=Offices)

Edit window below the search buttons. Click the "Done" button. The Formula Edit Bar at the top of the screen now displays the formula which will re-

A1	=Area((C=Offices))
----	--------------------

turn the area calculation of all objects that have been assigned to the class "Offices." You can also see the names and areas of all the individual offices that comprise the class "Office."

Press the Return key of the keyboard and the formula is entered into the worksheet. Cell A1 returns the accumulative total area.

Office Areas		
	A	B
1	1330.17983115	
2		
3		

Finding Objects

Sometimes you'll want to select a group of objects that are either a subset of a class or which cut across several classes. In the next section, you'll learn two methods to access these objects. In the first, you scroll through a name list and select only the objects you are interested in working with on the worksheet. In the second method, the wildcard, you search on a word common to all the objects you are interested in. MiniCad+ will then search across all the objects in the database and find all objects containing that word.

Database Row

A database row will return a cumulative total in the header cell and individual totals in subrows determined by the database search criteria. Click on Row Number 2

1	1330.17983115
2	Spreadsheet
3	Database

and select "Database" from the popup. This brings up the "Search Criteria" dialog box. This time click on the "Name" button.

Search Criteria:

☒ **Preset:**

☐ Visible ☐ Selected ☐ All

☐ **Edit:**

=DataBase()

Name List

The "List of Names" dialog box appears in which you scroll through to select the names to be added to the search criteria.

List of Names :

Office Areas
Room 101
Room 102
Room 103
Room 104
Room 105

Search Criteria:

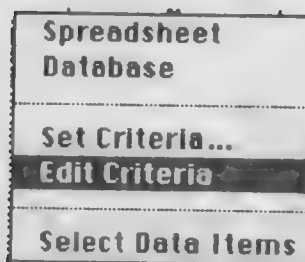
After selecting all the names for all six rooms and adding them to the search criteria, click the "Done" button. Click the "Done" button in the "Search Criteria" dialog box also. The Formula Edit Bar will contain all the rooms in the formula.

```
=DataBase(N IN ['Room 101','Room 102','Room 104','Room103','Room105','Room106'])
```

Pressing the Return key will enter the data into the worksheet. A difference in the worksheet is immediately apparent. Six subrows have been created, one for each room. To the left of the number 2 row number is a diamond marker indicating that this is a database row.

	A	B
1		1330.17983115
2		
2.1		
2.2		
2.3		
2.4		
2.5		
2.6		
3		

Wild Card



Doing a search with a wild card can save a lot of time and effort. In this case, the wild card in a formula says to grab everything that has the letters "Room" as its beginning characters. The above formula searches for all "N's" (names) that begin with "Room." Here you only had six named items. Suppose you had twenty or more named items?

Click on row number 2 again. This time select "Edit Criteria." The Formula Edit

=DataBase(N IN ['Room 101','Room 102','Room 104',Room103,Room105,Room106])

Bar will display the entire formula set in the database row.

Edit the formula by deleting everything inside the two brackets and type "N=Room~" as the illustration below shows.

=DataBase(N=Room~)

Hit the Return key and you'll see the database subrows remain. The "=" is called a Wild Card indicator. It is created by holding down the Option key and typing the letter X.

Subrows

The subrows in the database are directly linked to an object that meets the criteria of the search. For example, if you asked the program to search for all the IKEA chairs in the database, MiniCad+ would look at every object in the database to see if it were an IKEA chair. It would ignore every object that did not meet both criteria. The objects which met the criteria would be placed in the worksheet. Each row would contain data on one and only one object. In Row Number 2, six names meet the criteria. Thus, Row 2 has six subrows. Now that subrows are showing, you can work with the database.

Row Headers

The cells in row number two are headers for the subrows. Any criteria typed here will return data from the objects linked to the subrows.

Click on Cell A2, type in the Formula Edit Bar "=N." The names of the objects appear in the subrows in column A. They are not in ascending order. Click on the left sort

Office Areas	
1	1178.48312833
2	6
2.1	Room 101
2.2	Room 103
2.3	Room 105
2.4	Room 104
2.5	Room 102
2.6	Room 106
3	



Office Areas	
1	1178.48312833
2	6
2.1	Room 101
2.2	Room 102
2.3	Room 103
2.4	Room 104
2.5	Room 105
2.6	Room 106
3	

button and drag it into the cell A2. This will sort the listing in the row in ascending order.

B2		=Area
----	--	-------

Select cell B2 and type “=Area” into the Formula Edit Bar then hit the Return key. The area for each room is listed in the subrow for each room and a total is placed into the row header.

Office Areas			
	A	B	C
1	1330.17983115		
2	6	1330.17983115	
2.1	Room 101	186.66666667	
2.2	Room 102	366.1815638	
2.3	Room 103	184	
2.4	Room 104	257.63489787	
2.5	Room 105	184	
2.6	Room 106	151.69670282	
3			

Select cell C2. Click on the Worksheet menu icon to get the menu popup and select “Number” from the popup. In the dialog box that appears click the “Decimal” button, type “2” in the “Dec. Places:” box, and type a % sign in the “Trailer:” box. Click OK.

Number Format

☐ General
 ☒ Decimal
 ☐ Scientific
 ☐ Fractional
 ☐ Dimension
 ☐ Angle
 ☐ Date
 ☐ Boolean

Dec. Places:

☐ Use Commas

 Leader:

 Trailer:

Cancel

OK

C2		=Area*100/A1
----	--	--------------

Select cell C2 and type “=Area*100/A1”. The result is the percent of each room’s area to the total area.

Office Areas			
	A	B	C
1	1330.17983115		
2	6	1330.17983115	100.00%
2.1	Room 101	186.66666667	14.03%
2.2	Room 102	366.1815638	27.53%
2.3	Room 103	184	13.83%
2.4	Room 104	257.63489787	19.37%
2.5	Room 105	184	13.83%
2.6	Room 106	151.69670282	11.40%

Select the Worksheet menu item from the Command menu. When the dialog box appears, click on the "On Drawing" box. When this box is selected, an outline of the worksheet will appear on the drawing.

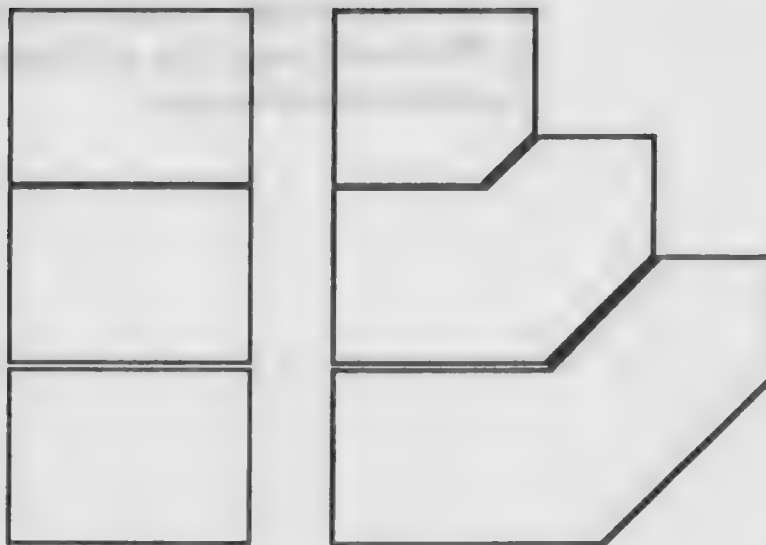
Close the Worksheet palette by clicking on its Close Box or clicking the "Open" button in the "Worksheet" dialog box to deselect it. The worksheet data will appear in the outline on the drawing.

Moving the Worksheet Around the Drawing

The worksheet may be moved around the drawing by selecting and dragging it as you would any other object in the drawing.

The worksheet may also be copied or cut and pasted to other layers. Pasting the worksheet to another drawing will place it as a graphic without a worksheet palette.

Here's what the "Room Areas" layer should look like when you're done.



1330.17983115		
6	1330.17983115	100.00%
Room 101	186.66666667	14.03%
Room 102	366.1815638	27.53%
Room 103	184	13.83%
Room 104	257.63489787	19.37%
Room 105	184	13.83%
Room 106	151.69670282	11.40%

Chapter 4

Using the Data Palette and Worksheet: II

"The Command Palettes let users group together a string of commands. It takes on aspects of a CAD toolkit." Robert Anderson as quoted in MacWeek.

"A MiniCad+ spreadsheet, which is integrated into the CAD package, can be called into a drawing, placed on it as a graphic, or left in for drawing specifications and accounting lists....'MiniCad+ has not only given me substantial timesavings in producing drawings, but it adds efficiency to exploring new designs...In many areas of my business I've managed to use this CAD package for improvement....I think I'm only touching the the tip of the iceberg.'" John Pacylowski as quoted in MicroCAD News.

Using the Data Palette and the Worksheet

As discussed in the previous chapter, the Data palette is your window to your database information, showing you what attributes you have tied to a particular object and allowing you to edit those attributes. In this chapter you'll learn how to use the Data palette in greater detail by learning how to format a record and its fields. You'll see that the Data Palette lists all records and fields and that the field values may be edited in the Data Palette.

Database records themselves are created through dialog boxes to allow you to take advantage of a number of options available during their formatting. The assignment of records to objects is done in the Data palette, which is available in the drawing window and allows easy access to the records.

As you go along, you'll also learn the ease with which the worksheet can access data assigned to objects, simplifying the creation of schedules, reports, cost analyses, and bills of material.

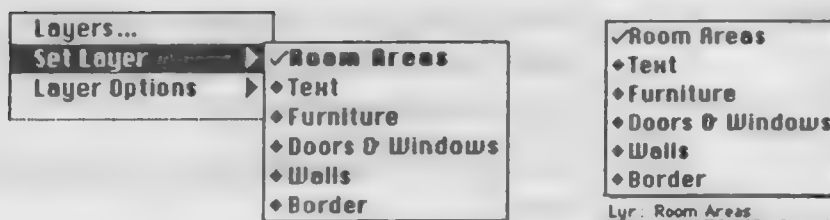
Setting up a Database

In this section, you'll establish a record for a desk/chair set, specifying its manufacturer and price.

Moving through Layers

The file created in the previous section of the tutorial ended in layer "Room Area." Go to layer "Furniture" by either:

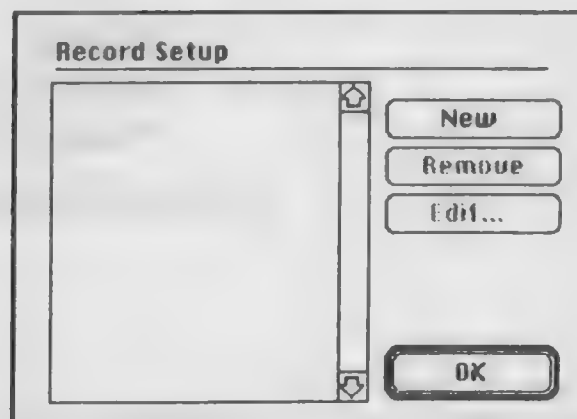
- Selecting the layer through the "Set Layer" menu item in the = = menu.
- Selecting the layer by clicking on the Layer section of the Data Display bar and sliding up the popup menu to select it.
- Holding down the Command key and pressing the Arrow Up or Down key until the layer is listed in the Data Display bar.



Select "Active Only" from the "Layer Options" menu popup. This will display only those items on that layer.

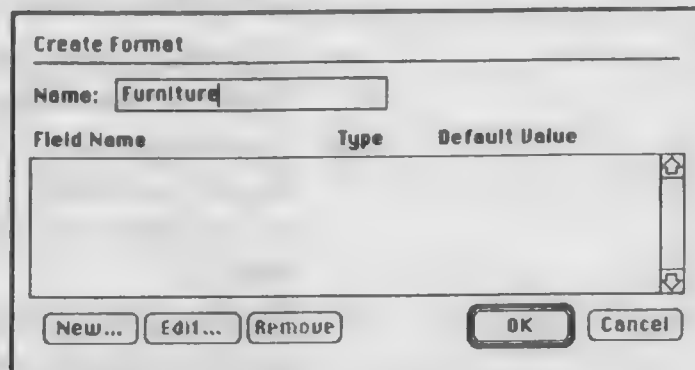
Record Format...

Select "Record Format..." in the ⌘ menu. The "Record Setup" dialog box is empty since no records have been formatted yet. Click the "New" button.



Create Format

The dialog box that appears controls the formatting of new records. The "Name" data entry box is automatically selected when the "Create Format" dialog box is opened. Type the name "Furniture."



The "Create Format" dialog box has a title bar "Create Format". Below it is a "Name:" label followed by a text box containing "Furniture". Below this is a table with three columns: "Field Name", "Type", and "Default Value". The table is currently empty. At the bottom of the dialog are five buttons: "New...", "Edit...", "Remove", "OK", and "Cancel".

Field Name	Type	Default Value
------------	------	---------------

There are no fields listed in the Field Name List since none have been created for this record. Click on the "New" button.

View Field

This dialog box handles the creation of fields for the record being formatted. It is blank when first opened.

The "View Field" dialog box has three sections:

- Name:

This data entry box is selected when the dialog box is opened. Type the word "Type."

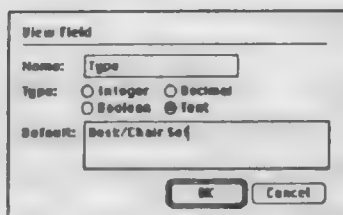
- Type:

The button selected here determines the format given the field. Be sure "Text" is selected.

- Default:

This is the field value. Type "Desk/Chair Set."

Click the OK button.



The "View Field" dialog box has a title bar "View Field". Below it is a "Name:" label followed by a text box containing "Type". Below this is a "Type:" label followed by four radio buttons: "Integer", "Boolean", "Boolean", and "Text". The "Text" radio button is selected. Below this is a "Default:" label followed by a text box containing "Desk/Chair Set". At the bottom of the dialog are two buttons: "OK" and "Cancel".

This returns us to the "Create Format" dialog box with one field formatted for the record "Furniture."

Field Name	Type	Default Value
Type	Text	Desk/Chair Set

Click the "New" button again. In the "View Field" box type in the following:

Name: Manufacturer
Type: Text
Default: American Furn. (be sure to abbreviate as shown).

Click the OK button.

Again click the "New" button in the "Create Format" dialog box. In the "View Field" dialog box type:

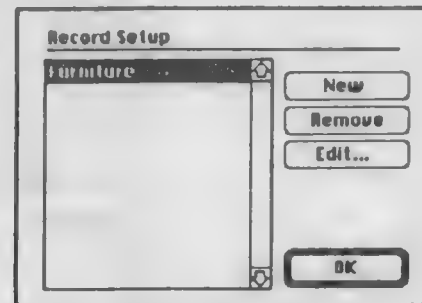
Name: Price
Type: Click "Number" button.
Default: 265.95

Click the OK button.

The "Create Format" dialog box for the record "Furniture" now shows three fields by name, type, and default value. Click the OK button.

Field Name	Type	Default Value
Type	Text	Desk/Chair Set
Manufacturer	Text	American Furniture
Price	Number	265.95

This returns you to the "Record Setup" dialog box which displays one record, "Furniture."



Click the OK button here to return to the drawing.

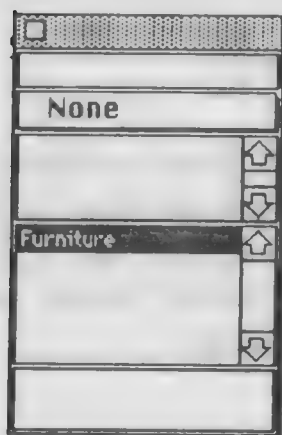
Assigning Records

In the following section, you'll link the record you've just created to certain objects you've already drawn. Note that there are two strategies for linking records and objects. In the first, you draw an object and then assign it attributes such as brand name and color. In the second, you realize that you are going to draw or have drawn a group of similar objects, so rather than assigning them attributes one by one, you set up an applicable record first. This is what you did in the prior section. In this section, you'll work some more with the record format "Furniture," using "Custom Selection" and the Command Palette to isolate those objects you're interested in at the moment.

Record— Data Palette



Data Palette Record Display



The record that was formatted and its fields are displayed in the Data palette when the drawing reappears on the screen. If the Data palette is not open on the drawing, select it from the Page menu.

When no objects on the drawing are selected, the Data palette displays the available Record Format in the middle box. Currently there is only one Record Format in the drawing, "Furniture."

The fields of the selected record in the middle box (i.e. "Furniture") are displayed in the next to bottom box. As you can see, they are "Type," "Manufacturer," and "Price."

The default value of the selected field, in this case "Desk/Chair Set," is displayed in the bottom box. You can use the bottom box to edit a field.

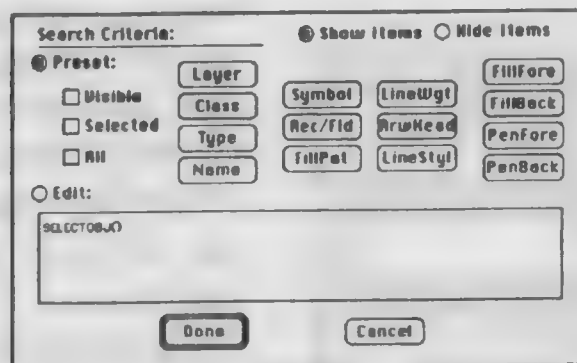
The display of records and fields in the Data palette is determined by the number of objects selected.

Select an object on the screen. The Data palette changes and places all available records in the next-to-bottom box.

It is from this box that you assign records to objects. You could choose "Select All" (⌘ A) and assign the record to all the objects in your drawing by double-clicking on the selected record. But since you'll need to edit the field values of different objects, you'll select similar objects.

Custom Selection

You would like to assign the above record only to objects that meet certain criteria. In the \mathbb{X} menu select "Custom Selection." This brings up the "Search Criteria" dialog box. You know that the furniture in the drawing are symbols. Click on the "Symbol" button.



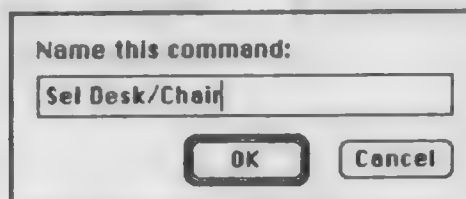
Scroll through the Symbol Library until you see the symbol for the Desk/Chair Set. Double click on that symbol.

The "Search Criteria" dialog box will return with the data for the Desk/Chair symbol in the Edit box below the criteria selection buttons.

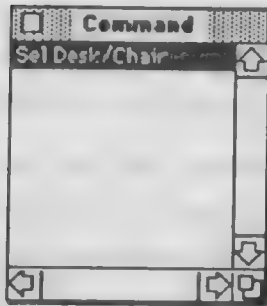
Click the "Done" button at the bottom of

```
SELECTOBJ(S='Desk/Chair Set')
```

the "Search Criteria" dialog box. A dialog box will appear asking you to type in a name for the command you created. Type "Sel Desk/Chair." Click the OK button in the dialog box when finished.



Command Palette



A new palette, the Command palette, will appear on the drawing. In the palette will be a command, "Sel Desk/Chair." Double-click on the command. The five Desk/Chair sets in the drawing will be selected.

Editing a Record

In the following section, you'll edit the attributes you assigned to the record "Furniture" to make them compatible with individual objects and with similar groups of objects. This is clearly easier than going through the process of attaching a different record to every single object you draw.

Multiple Record Assignment



Move the cursor to the Data palette and double-click on the record "Furniture." All five Desk/Chair symbols have been assigned the record.

Deselect the objects by clicking the mouse with the cursor in an empty space on the drawing. Select any of the Desk/Chair symbols. The Data palette indicates that the symbol has been assigned the record "Furniture."

Click on the different fields of the record in the next to bottom box of the Data palette and you'll see the value of each field in the bottom box.

Editing Default Values of Fields

When an object that has been assigned a record is selected, such as a Desk/Chair symbol, the value of its fields may be edited in the Data palette.

Select the Desk/Chair that is in Room 101, the bottom left desk/chair. Move the cursor to the Field section of the Data palette. Click on the field "Price." Move the cursor

Multiple Editing of Record Field Values

Edit Format

to the bottom box. Click the mouse in the box. The value may be edited as in any other text box. Change the value to 355.00.

Select any other Desk/Chair symbol and it will have a price of 265.95. Select the one you edited and it will have a price of 355.00.

You'll choose to give every object on the "Furniture" layer the record "Furniture." However, the only objects that matched the field default values were the Desk/Chair symbols. It is easier to change the Defaults than to assign the record to all the objects and edit them individually.

Deselect all objects by clicking in a blank area of the drawing or by double clicking on the pointer tool. When no objects are selected on the drawing, the Data palette allows the user to display and modify all of the record formats available in the drawing. Select the "Furniture" record format in the Data palette displays its defaults, and its first field, "Type," will automatically be selected. Change the type to "File Cabinet" by editing the text in the last box of the Data palette. The next field may be selected by clicking on it with the mouse or by hitting the tab key. Change the "Price" field to have a default of "93.65."

Changing the defaults of a record format will not affect any of the records that have already been added to the drawing; it only changes the defaults for new records to be added to objects. You can change the defaults for a record format at any time.

Select the "Custom Selection" menu item. This time create a command for the File Cabinet symbol. Double-click on the command to select all file cabinets. Double-

click on the "Furniture" record to assign it to the selected objects. All the file cabinets will have the new default values.

Assign the record, "Furniture" to the Chair, Conference Set, Work Table, and Desk symbols. You may wish to edit the record then select all the Chair symbols since there are several of them. (If you type in the entire words "American Furniture," the words will not fit into the default cell size in the worksheet. You either have to abbreviate, as is shown below, or widen the cell size of the row in the worksheet that contains "American Furniture.")

	Field	Value
Chair	Type:	Chair
	Manu.:	American Furn.
	Price:	48.50
Conference Set	Type:	Conference Set
	Manu.:	Specialty Wood
	Price:	
Work Table	Type:	Work Table
	Manu.:	American Furn.
	Price:	67.50
Desk	Type:	Desk
	Manu.:	American Furn.
	Price:	87.95

Create a new record for the computer with the following specs.

Name:

Field Name	Type	Default Value
Manufacturer	Text	Apple
Model	Text	SE 030
Price	Number	2699

Using the Worksheet

Now that you have linked records and objects, it's time to use this information in the worksheet. In the worksheet, database and spreadsheet meet. You can use the worksheet to create rows that are purely spreadsheet rows (i.e., not linked to the database) or database rows, which are linked to the database and yet also allow you to perform spreadsheet calculations. In this section, you'll use a spreadsheet row to type in text for column headers. Then you'll have a database row search for all objects that have a "Furniture" record assigned to them. Using the "Sum" button, you'll combine all data in a column that is of equal value. Thus, you'll change an item list to a materials list.

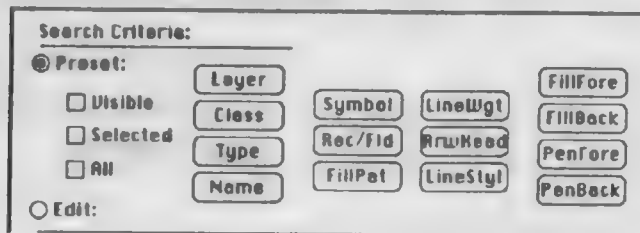
New Worksheet

Create a new worksheet and name it "Office Equipment." Row 1 will be a spreadsheet row. Select cells A1, B1, and C1 by clicking and dragging the cursor through the cells. Type "Equipment" in cell A1 and press the Return key.

1	► Equipment	Manufacturer	Price
---	-------------	--------------	-------

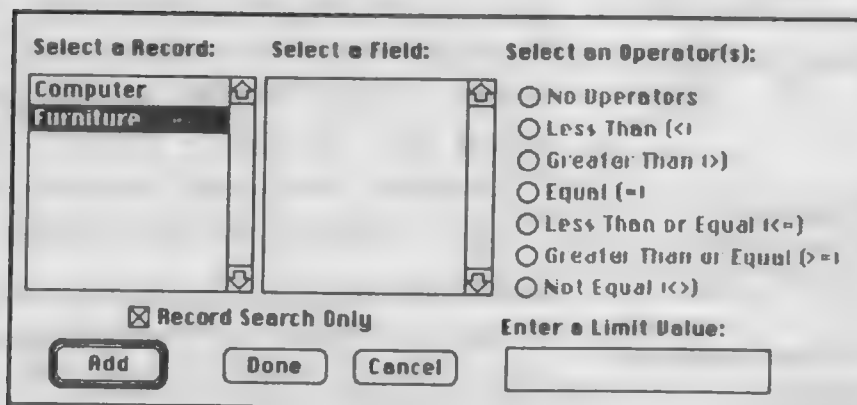
Since A1, B1, and C1 were selected, pressing the Return key placed the data into cell A1 and selected cell B1 instead of selecting cell A2. In cell B1 type "Manufacturer" and "Price" in C1.

Select Row 2 and set it to be a database row. When the "Search Criteria" dialog box appears, click on the "Rec/Fld" button.



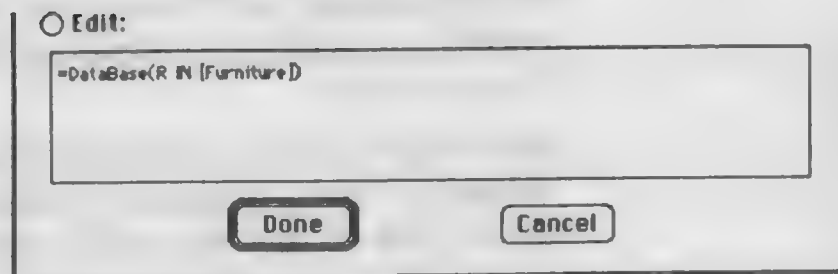
The "Search Criteria" dialog box has a title bar "Search Criteria:". It contains two main sections: "Preset:" and "Edit:". Under "Preset:", there are three checkboxes: "Visible", "Selected", and "All". To the right of these checkboxes are two columns of buttons. The first column contains "Layer", "Class", "Type", and "Name". The second column contains "Symbol", "Rec/Fld", "FillPat", "LineWgt", "ArwHead", "LineStyl", "FillFore", "FillBack", "PenFore", and "PenBack". The "Rec/Fld" button is highlighted.

The next dialog box will list two records, "Computers" and "Furniture." Select the "Furniture" record by clicking on it. The fields for the "Furniture" record will appear in a list to the right of the selected record. Since you want all objects that carry the "Furniture" records and not a particular field within the record, click on the button "Record Search Only" then click the "Done" button.



The "Select a Record" dialog box has three main sections: "Select a Record:", "Select a Field:", and "Select an Operator(s):". Under "Select a Record:", there are two list boxes. The first list box contains "Computer" and "Furniture", with "Furniture" selected. The second list box is empty. Under "Select a Field:", there is an empty list box. Under "Select an Operator(s):", there are seven radio buttons: "No Operators", "Less Than (<)", "Greater Than (>)", "Equal (=)", "Less Than or Equal (<=)", "Greater Than or Equal (>=)", and "Not Equal (<>)". At the bottom, there is a checkbox labeled "Record Search Only" which is checked. To the right of this checkbox is a text box labeled "Enter a Limit Value:". At the bottom left, there are three buttons: "Add", "Done", and "Cancel".

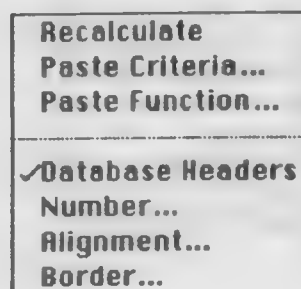
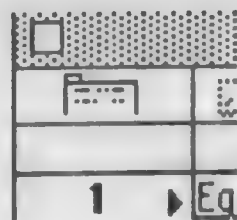
The "Rec/Fld" dialog box will close and the "Search Criteria" dialog box will return with the criteria listed in its Edit box. Click the "Done" button.



The worksheet palette will redraw with a subrow for each object assigned a "Furniture" record.

Organizing Information in the Worksheet

Now that the database subrows are linked directly to objects that matched the search criteria you'll request the worksheet to return specific data from those objects.



Deselect all objects. Select cell A2. Type an (=) into the Formula Edit bar. Click on the Worksheet menu icon above the row numbers. When the popup menu appears select "Paste Criteria" and click the "Custom" button. In the "Search Criteria" dialog box select the "Rec/Fld" button. Select the "Furniture" record and then select the field "Type." Click the "Done" button.

When the worksheet returns press the Return key or click the "Check" button in the edit bar and it will list the "Type" field value of each object linked to the "Furniture" record. The objects are listed as they appear in the object creation list of the file.

In cell A2 is the total number of objects that contain the record. To sort the list either in ascending or descending order, click on the row number (2). The sort buttons are no longer grayed out. Grab the one you want and drag it into the column.

Click on cell B2. Place an (=) into the formula edit bar. Click on the Worksheet menu icon and again select "Paste Criteria." Select the "Rec/Fld" button and select the "Furniture" record from the record list in the dialog box that appears. This time select the "Manufacturer" field and click the "Done" button in both this dialog box and the "Paste Criteria" dialog box.

When the worksheet redraws, each object in the list will display its manufacturer.

Select cell C2. Place an (=) into the edit bar and this time select the "Price" field from the Criteria Dialog box.

You'll notice that the last column of prices lists only the raw numeric price of each item, but is not displayed in a traditional monetary format. To change the way that values are displayed in the worksheet, use the "Number..." menu item.

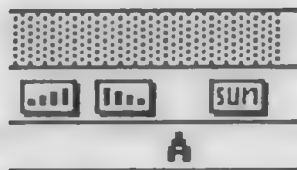
Select the header cell C2 in the worksheet and choose the "Number..." menu item from the worksheet menu located on the palette. The default number format for any cell is "General," a format that displays every significant digit of a decimal or integral number. Choose the decimal option instead. Leave the number of decimal places at two (we'll display prices to the nearest cent), and put a dollar sign into the leader box. The leader is a string of up to seven characters that will be displayed

before the number in the worksheet, while the "trailer" is a string of seven characters that displays after the value. Leave the trailer blank and choose the "Use commas" check box. Using commas will put a comma after every three digits to the left of the decimal point (e.g. It will display "\$1,000.00" instead of "\$1000.00"). Click OK in the dialog box.

The price column now displays the same numbers using traditional monetary format.

The completed worksheet displays a sorted item list of each object that matched the criteria set in the database row and its field values.

To the right of the Sort icons is an icon called "Sum." Drag this icon into column A. The worksheet will redraw placing all "Type's" of equal value in the same subrow. This changes the database row from giving an item list to displaying a materials list. Since the manufacturers of similar objects may be different, this column displays a total of items in its corresponding subrow. The subrows in the Price column displays a total for each corresponding subrow. Now you are ready to print your report.



Chapter 5

3D Design

"The 3-D aspect is like icing on the cake. Any item that you draw can extruded or rotated to create a solid...a floorplan can be extruded and rotated to produce an isometric or perspective of a proposed space. Symbols can be three dimensional and located relative to a plane. You have control over the location of a single light source and the camera and viewpoint location for perspective rendering....The fill and color of any plane can be altered...." Ross Slade, NCMC Bulletin

"MiniCad+ has extensive facilities for 3-D objects....it may well have the best 3-D capabilities among the low-cost (less than \$1,000) CAD programs." MacUser

Using 3D

This chapter will explore 3D design, giving you a taste of MiniCad+'s versatile 3D capabilities. Because MiniCad+'s 3D exists right in the 2D window, it is easy to turn 2D objects into 3D models. As you work through this chapter of the tutorial, please note the *interactive* nature of 2D and 3D in MiniCad+. Most 2D tools can be used to edit 3D objects. The most effective way to use MiniCad+'s 3D is to move back and forth between 3D creation and 2D tools, assembling complex 3D models through MiniCad+'s powerful 2D capabilities.

The chapter will begin by looking at some simple examples of 3D extrusion, editing extruded objects, and creating "swept" objects. Next you'll edit surfaces to create objects of greater complexity, such as a cylinder with teeth and a steeple. You'll then extrude the 2D office plan you previously drew, first into a wireframe, then into a rendered 3D model. You'll also do a multiple extrude of the same building in order to create multiple stories, render them and set a new perspective. Finally, you'll explore how setting different perspectives can change the level of shading in the model.

The actual tutorial section of this chapter, which continues working with the office floorplan, begins on page 5.14. If you would like to maintain a continuity with previous chapters, please turn to page 5.14.

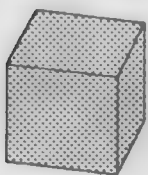
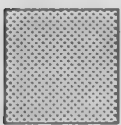
Creating Objects Using 2D and 3D Tools

Most 3D drawings are comprised of many different types of objects. This section of the 3D chapter explains the use of 3D tools and their interplay with other tools and commands. In this section, you'll create such objects as a cylinder within a cube, a cylindrical sweep with an empty center, a roof, a cylinder with teeth, and a steeple.

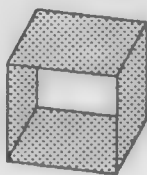
There are three menu items specifically for 3D. They are in the Δ menu. One menu item is for creation, one for rotation of the entire 3D drawing, and one for working independently with 3D objects. All three menu items have popout menus for multiple selections. In addition, many of the commands and tools used in 2D drawing work in 3D as well.

Extrusion

Rectangle



Lines



This program looks at lines and objects with surfaces quite differently. Objects with surfaces such as rectangles, polygons, arcs, etc. will have a top and bottom surface when extruded, creating wireframes of solid shapes. Lines will only have depth.

A rectangle extruded has a top and bottom surface (a closed box). Extruding four lines that represent a rectangular shape will create four sides of a box but no top or bottom.

Draw a rectangle and while it is still selected, select "Extrude" ($\% E$) from the "3D Creation..." menu item under the Δ menu.

Reshape

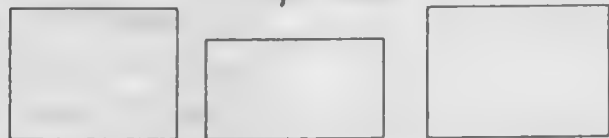
The rectangle is given depth at the same

Absolute Views

dimension as its width. Select "Reshape" from the Edit menu (⌘ R). Type in the depth to which you want to change the extrusion. The object on the screen is a six sided wireframe.

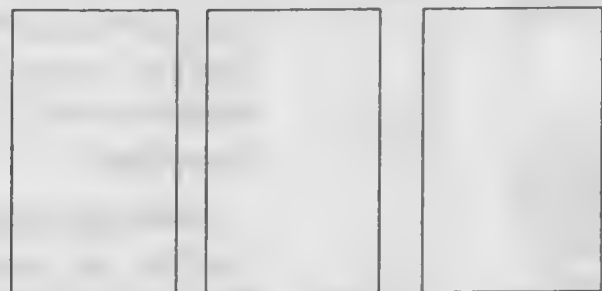
An absolute view shows only one surface of a 3D object, so that the object appears flat. Six absolute views (front, back, left, right, top, and bottom) are available from the "3D View" pop-up menu under the Δ menu. Another way to resize objects is to select one of these absolute views and grab the object's handle as if you were doing a 2D reshape. When an object is first extruded you see it from the top view.

Top View



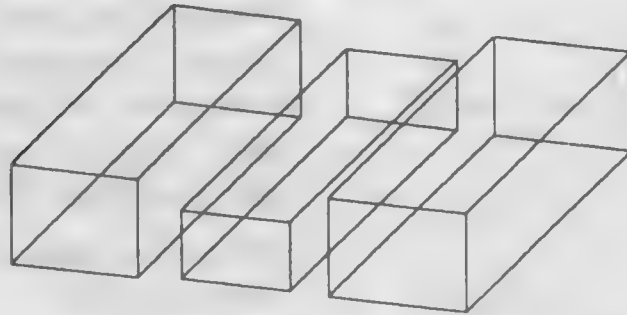
These three rectangles were extruded from Top View.

Front View



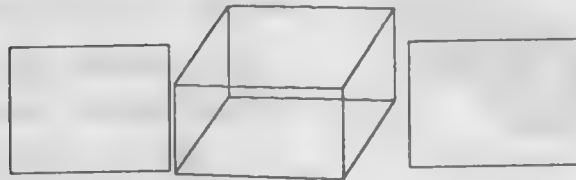
From the Front View you see they all have the same depth. They are grouped.

3D View Rotation



Using "3D View" all objects would rotate together.

3D Object Rotation

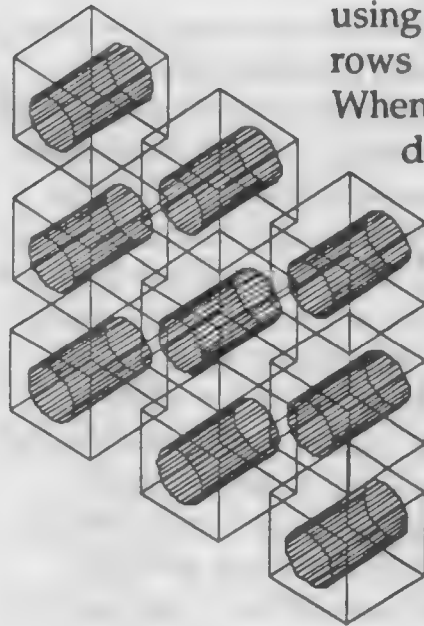
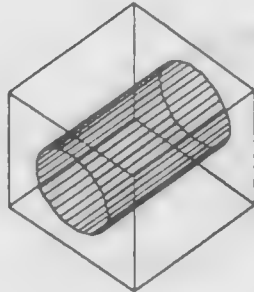
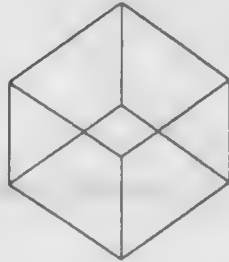


Ungroup the objects. Select the middle object and rotate it using "3D Objects" not "3D View."

"The integrated 3D makes it easy to extrude several objects in the drawing at once, automatically snap them together, and view them at any angle, either as wireframes or as shaded solids....While working in 2D, Pacylowski can have 3D objects present at the same time, on the same layer. This speeds work and can even solve disputes. 'It was difficult sometimes to explain to a client that the placement of the deck was in conflict with fireplaces, windows, and doors of the house...I FAXed him a solid 3D object and he was able to see my point.'"

AES

Enter and Exit Group



These menu items allow working inside groups of objects, symbols, and 3D objects for editing purposes.

When a 3D object is selected and the "Enter Group" command is chosen from the == menu, the 2D primitive of the selected object appears on the screen which can then be edited. For example:

Draw a rectangle, extrude it, then rotate it on the screen.

With the 3D object selected, select "Enter Group" from the == menu. You'll see the original 2D rectangle on the screen.

Draw a circle inside the rectangle, and select "Exit Group."

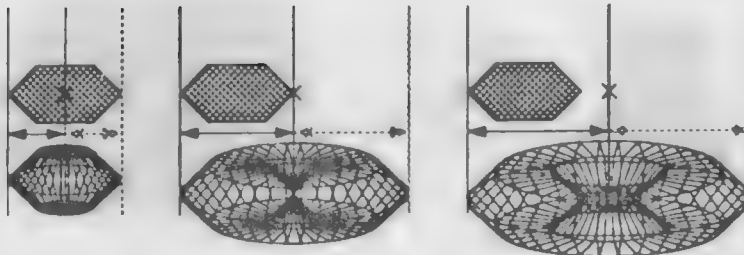
This returns you to the 3D view of the object before you selected "Enter Group." The circle you placed in the rectangle while within "Enter Group" is now extruded at the same depth as the rectangle and placed inside the rectangle exactly as you created it in 2D.

With the 3D objects selected, select "Enter Group" from the == menu again. This time using "Duplicate Array" (see 1.13) create 3 rows and columns of the 2D primitives. When you select "Exit Group" you'll have duplicates at the original rotation.

One object may be set in 3D then edited to create complex objects.

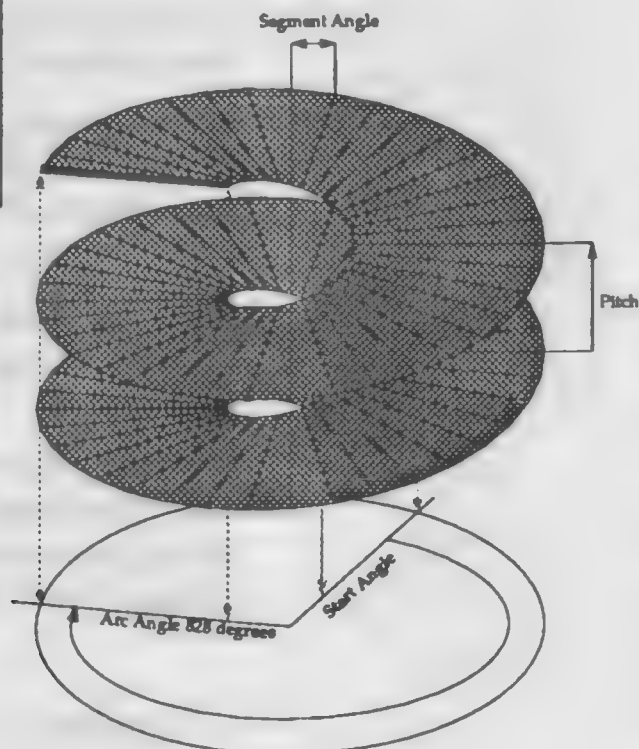
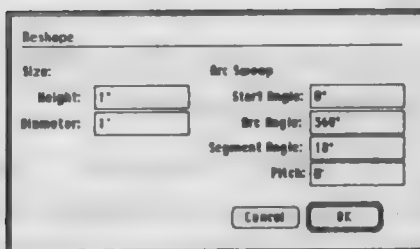
Sweep

Sweep allows you to create cylindrical objects by using a combination of any object and a locus point. The locus point acts as the pivot point around which the sweep will occur. If the locus is offset from the object instead of being precisely on an edge this will cause a doughnut hole effect.



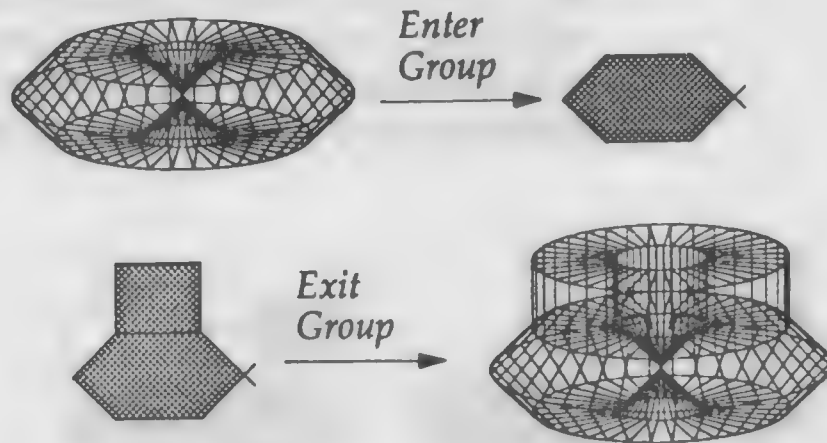
Reshaping

The "Reshape" dialog box under the Edit menu for sweep allows you to control the start angle, arc angle, segment angle, and pitch.

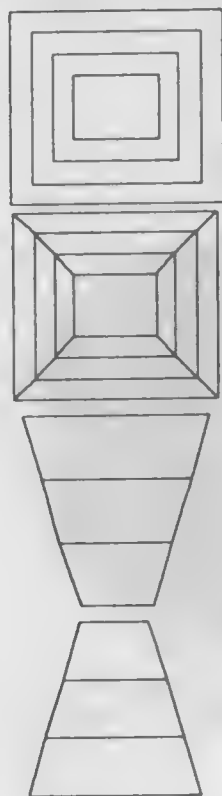


Enter & Exit Group

These commands can also be used with sweep to create and edit complex swept objects, as below.



Multiple Extrude



Select several objects and "Multiple Extrude." The objects are extruded in sequence from the bottommost object in the drawing list at the average width of the overall selection.

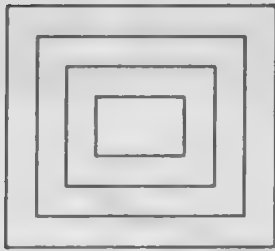
The larger rectangle was the first drawn. The smallest was the last drawn.

After selecting "Multiple Extrude," you can see how the corners of the objects are connected to the next object.

The extrusion was done in "Top View." Going to "Front View" shows the objects extruded at the same distance from each other.

Reversing the order of drawing will reverse the extrusion. The extrusion can also be toppled forward or backward twice to change how it sits in the 3D view.

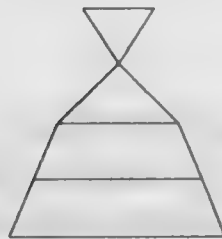
Locus



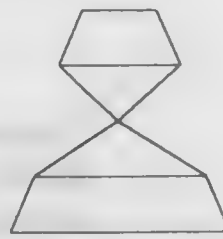
Placing a locus in the center of the objects will cause the multiple extrude to include the locus point. Moving the locus point up and down in the object list will change the extrusion. Use the "Enter Group" command to bring up the 2D primitives, then select the locus point and use the "Send Forward" and "Send Backward" commands to move it up or down in the list. Select "Exit Group" to see the results. Below are some examples:



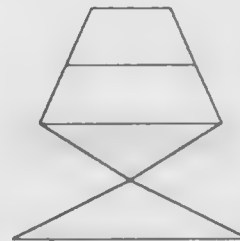
Top of object list



Send backward once

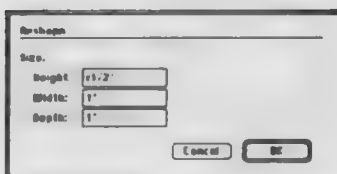


Send backward twice in list

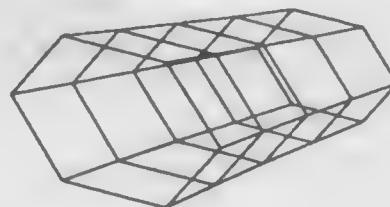


Send backward three times

Reshape



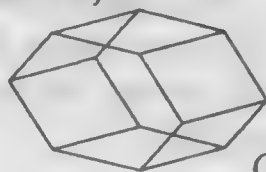
The dialog box that appears when selecting "Reshape" allows changing the dimensions along the Y (height), X (width), or Z (depth) planes of the overall object. Changing the distances between the extruded objects can be done by using "Convert to Mesh," selecting the vertices of the object, and moving them.



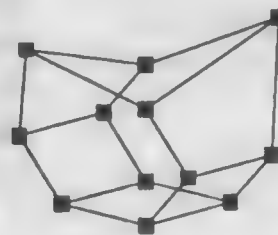
Convert to Mesh

A mesh is a wireframe that is flexible, as though each vertex were tied together with elastic connectors. Objects converted to mesh cannot be taken apart, only manipulated. Any 2D or 3D object can be turned into a mesh. In the example below the handles of a meshed object were stretched to form a new shape.

Extruded object



Convert to mesh

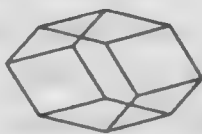


*Joints are
editable*

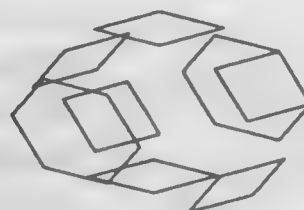
Enter Group

Selecting the "Enter Group" command under the == menu while a meshed object is selected is the same as converting the object into 3D polygons using the "Convert to 3D" menu item. Each surface can be manipulated as a 2D polygon, only in 3D space. In this state you can explode, delete or reshape any surface of the object.

Mesh object



Enter group

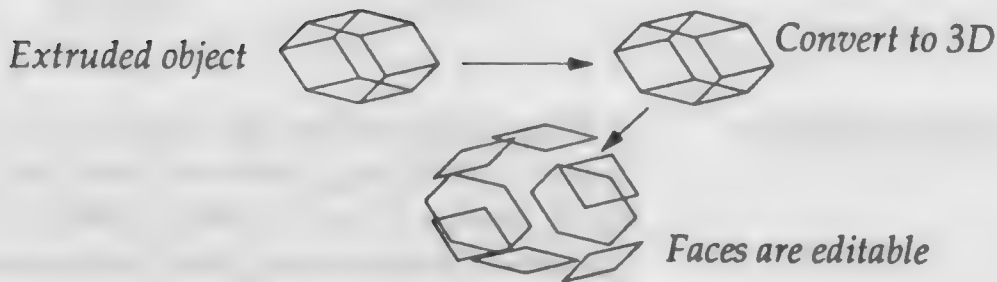


*Faces are
editable*

Choose "Exit Group" to return to the main drawing.

Convert to 3D

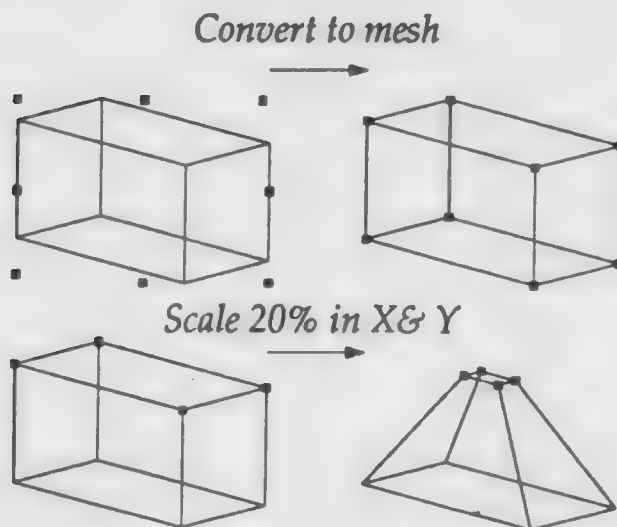
Applying the "Convert to 3D" command to an extruded object converts it to a series of polygons that can then be edited as any 2D polygon would be edited. Vertex points can be added and subtracted by selecting any of the polygons and the "Reshape" command. By pressing Command or Option-Command you can add or subtract vertices from the polygon.



The following are examples of 3D editing which are easy to use but allow creation of complex objects.

Scaling Meshes

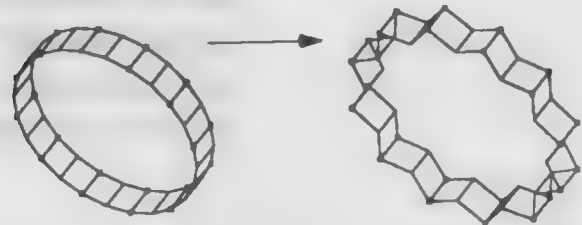
Below an extruded object is converted into a mesh. The top is selected and scaled to 20% along the X and Y axes from the top view.



Important note:
Do not try the following examples in any isometric view as shown but perform all edits in absolute views i.e. Front, Side, Back, etc.

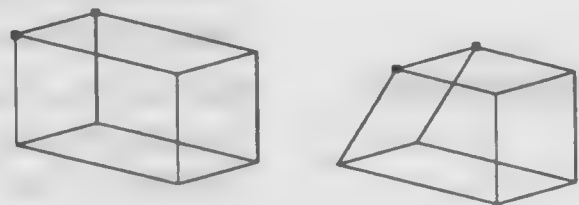
This technique is useful for creating wedge shaped objects, such as roofs.

Below, scale is used with an extruded circle to produce teeth. Every other vertex pair is selected, and then the selection is scaled by 120% along the X and Y axes from the front view.



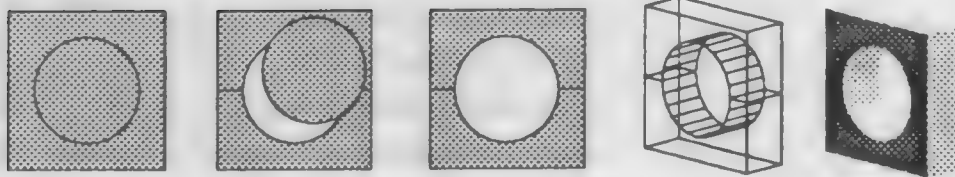
Moving Meshes

In the example below the "Move..." command under the Δ menu is used with a mesh to move two selected points to a specified distance along the X axis. Select the points, select "Move..." from the Δ menu and type in the X or Y offset in the dialog box.



Punching Holes for Renderings

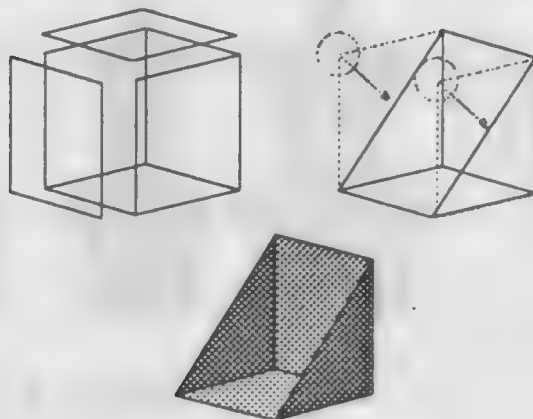
With this technique a hole will be punched through a 2D polygon before turning it into a 3D object. In the illustration below this is done by placing a circle over the polygon and then choosing "Clip Surface." MiniCad+ will punch a hole in the underlying polygon by cutting it in half. The circle is then removed and deleted. When the results are extruded, a 3D wireframe will be produced that contains a hole and will render with a hole.



Removing and Editing Surfaces

Surfaces of cubes or other 3D shapes can be removed. Select a cube, then select "Convert to 3D." This changes the solid cube into 3D polygon surfaces.

The top and front surface may be selected and removed. Select the desired surface, then "Reshape." This will activate the vertex handles instead of the bounding box handles. The corner vertex of each surface shown below may be removed by holding down both the Option and Command keys

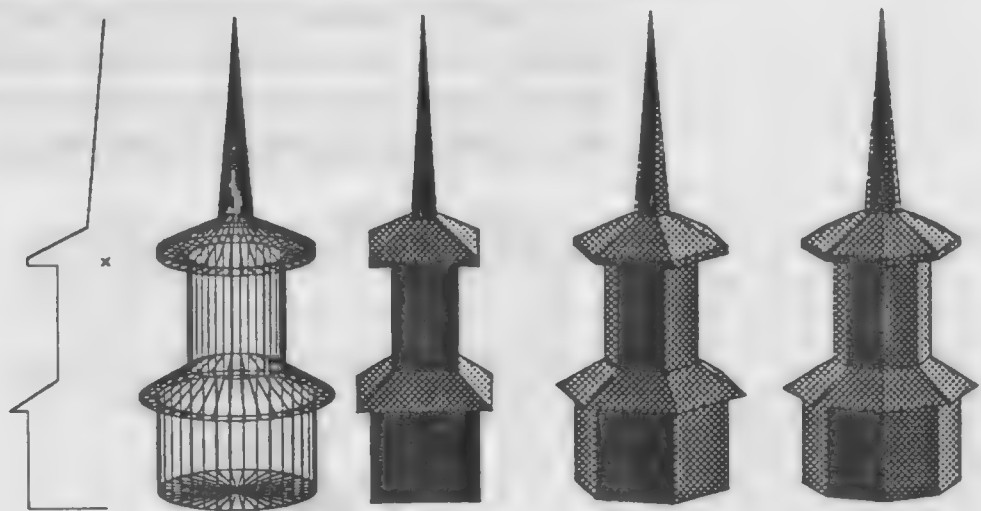


Sweep

and clicking on the vertex to be deleted. When rendered the object will look something like the bottom picture in the group below.

A locus point is placed as a pivot point around which an object will be swept. The first object below is a profile of a steeple. The profile is swept around the locus represented by the dot to the left of the top eave. You can reshape the sweep to produce various results. Select the wireframe, then the "Reshape" menu item and change the segment angle in the dialog box. The wireframe below has a segment default angle of 10° . The subsequent rendered models used segment angles of 90° , 60° and 45° . This technique is useful for quick and easy changes to a variety of swept objects, such as columns, steeples, bowls, satellite dishes, etc.

Another way this feature can be useful is in editing symbols. For example, if a 3D column is stored as a symbol and later the resolution of the surface segments needs to be increased, you need only edit one symbol in the drawing and all the symbol instances of the column in the drawing will automatically be edited.



Converting the Office into 3D

Now that you have become acquainted with some of the major features of 3D, you'll move on to extrude the 2D floorplan you created earlier, render it, and set a perspective.

Open file "Basic floorplan" and save it as another name.

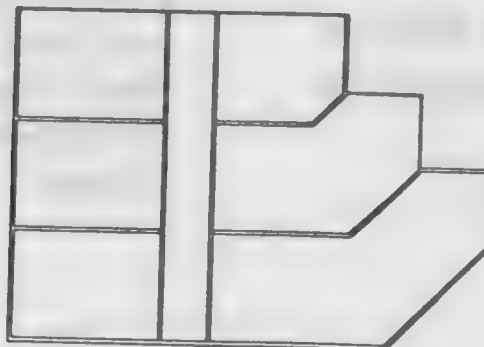
The drawing in this file is made of lines. Choose "Select All" (⌘A), and then select "Extrude" from "3D Creation" under the Δ menu (⌘E). A single 3D object is created.

3D Creation ►

Extrude ⌘E
Sweep
Multiple Extrude
Convert To Mesh
Convert To 3D
Render...
Set Perspective

Top View

The program defaults to the Top View when an object is first extruded in 3D. An extrusion of the floor plan looks like a 2D drawing because its depth cannot yet be seen.

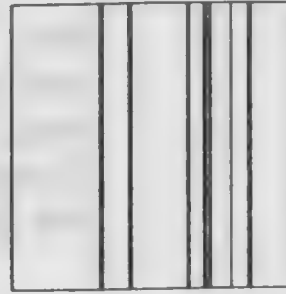


3D View ►

Rotate...
On Screen

Front
Back
Left
Right
Top
Bottom

From the "3D View" menu item popup under the Δ menu select "Front."



When the lines are extruded they acquire a depth equal to the width of the object being extruded. While the 3D object is selected, select "Reshape" (⌘ R).

Reshape

Size:

Height: 36'-0"

Width: 52'-0"

Depth: 52'-0"

Reshape

Size:

Height: 36'-0"

Width: 52'-0"

Depth: 9'-6"

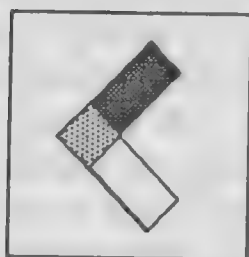
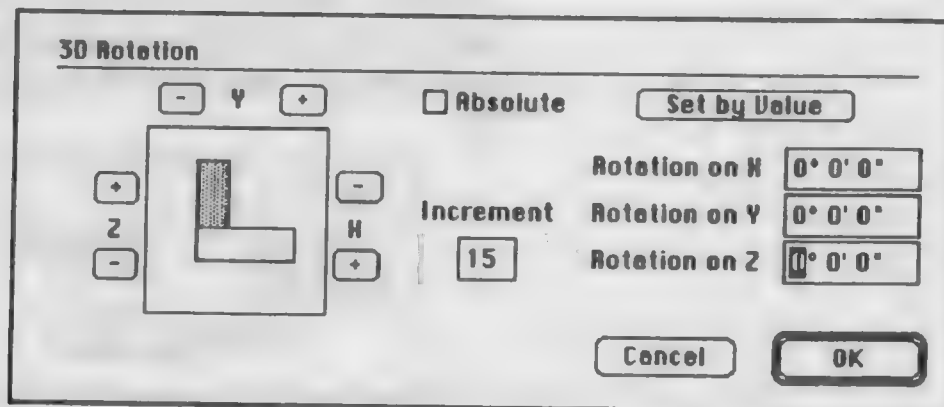
The "Reshape" dialog box now shows a third dimension since the object being reshaped is a 3D object. Change depth to 9'-6".



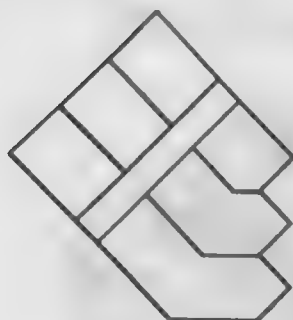
3D View ►

Rotate...

Go back to the Top View. Select the object and then select "Rotate..." from "3D View." On the left side of the dialog box that appears are several plus and minus buttons.

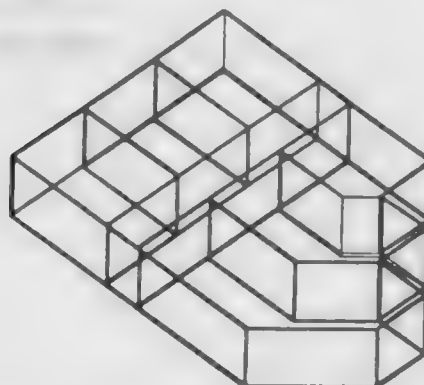
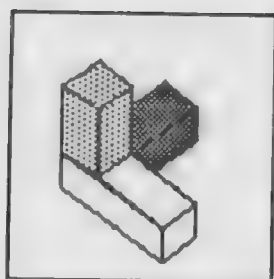


Click on the "Minus Z" button three times. Note that each time you click on the button, the XYZ axis in the center of the buttons rotates by the number of degrees in the "Increment" box. Click 3 times on the minus button to rotate -45° on the Z axis of the "Top View." Click the OK button.



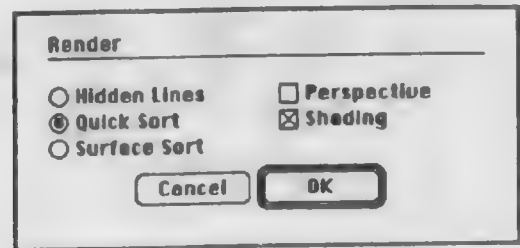
The drawing is rotated to match the rotation of the XYZ axis in the window of the "Rotate..." dialog box. The design represents your drawing in the current view.

Again select "Rotate..." from the "3D View" popup menu. This time click the minus X button 3 times. The top of the XYZ axis in the dialog box window will rotate away from you and the bottom will rotate towards you. Click the OK button. The drawing and XYZ axis in the dialog window have identical rotations.

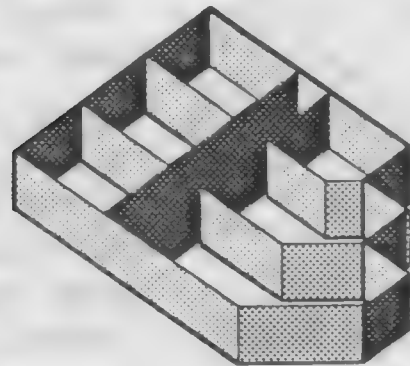


Render

Select the wireframe above and select "Render" from the "3D Creation" popu menu. The "Quick Sort" button is selected. Click on the "Shading" button and click OK.



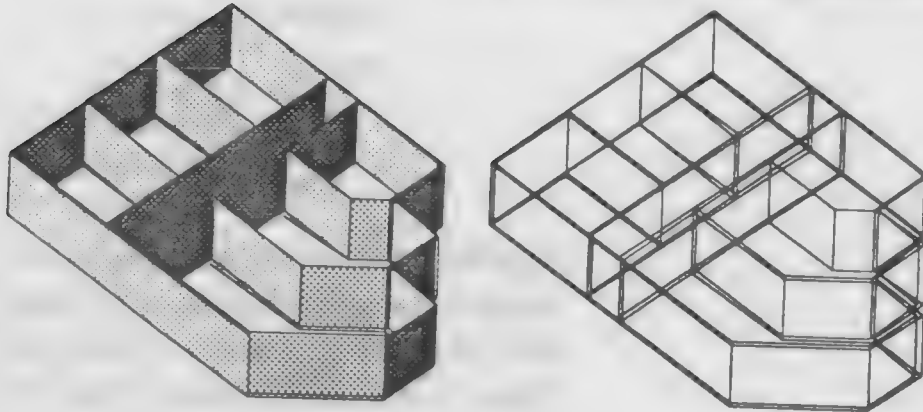
Shading is applied to renders based on the position of a light source (represented on screen by a Sun icon) in relation to the model. When you are returned to th drawing nothing happens. The program is waiting for you to click the mouse button to place a light source. Move the cursor to the upper left of the drawing and click the mouse to insert the Sun icon.



When the screen redraws a render similar to the one below will appear. It will be selected.

Renders are groups of 2D lines and polygons superimposed over the 3D wireframe.

Below the render is the original 3D wireframe. Click and drag the render off to the left. The program does not delete the 3D wireframe when renders are created. The

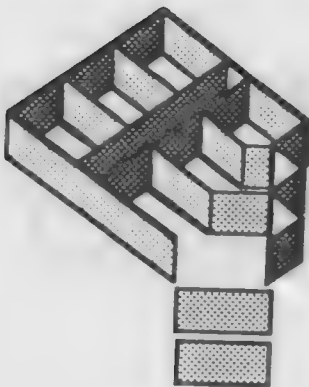


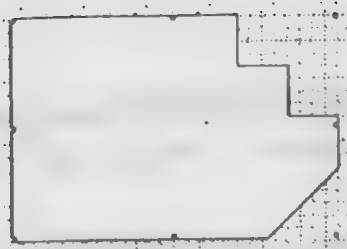
wireframe can be rotated again and again to render as many views and rotations as you wish.

As a group of 2D polygons representing the 3D object, a render may be taken apart (or "exploded").

Select rendered object and "Ungroup" it (⌘U) under the == menu. Handles will appear for each 2D polygon in the render. Click the mouse in an empty part of the drawing to deselect all objects in the drawing.

Move the cursor to the closest wall. Click and drag the wall away. You'll see a second polygon behind the first because the walls were made with a double-line tool. Select and remove the second wall.





Select "Top View" under "3D View." Draw a polygon on top of the 3D floor plan, snapping to the outside wall vertices. With the polygon selected do an extrude (⌘ E). Next, do a reshape (⌘ R) and give the floor slab 6" depth.

Select "Front view" in "3D View." The floor slab and the building are not snapped

Reshape

Size:

Height:	36'-0"
Width:	52'-0"
Depth:	6"

together. Move the selection cursor to the top left corner of the floor slab until you get the Snap Drag cursor. Click the mouse button and hold it down while dragging the floor slab and snap it to the bottom left corner of the building.

Virtually all 2D tools work with 3D objects. Select both objects, group them, and choose "Dimension V" under the "Tool" menu. The vertical dimension will be 10'.



Using Extrusion and Perspective

In this section, you'll create a six-story office building by doing an extrusion. You'll then render the building and set several different perspectives. Finally, you'll do a multiple extrusion as an alternative way of creating six stories.

You'll use the height of the slab and wall as the basis for creating several floors for the building. Select the grouped building and slab while in "Front View," then select "Duplicate Array." Type the number 5 in the "Copies" box and 10' in "Y Offset." Then click OK.

Duplicate

Copies:

☒ Rectangular Array
☐ Circular Array

Alteration

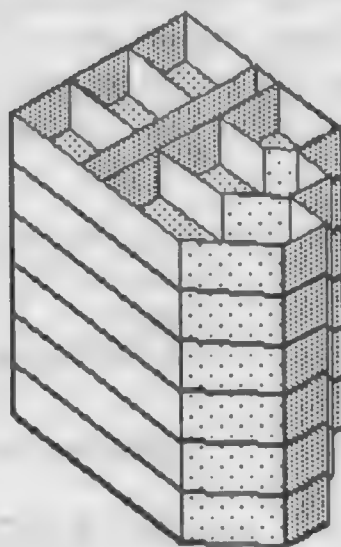
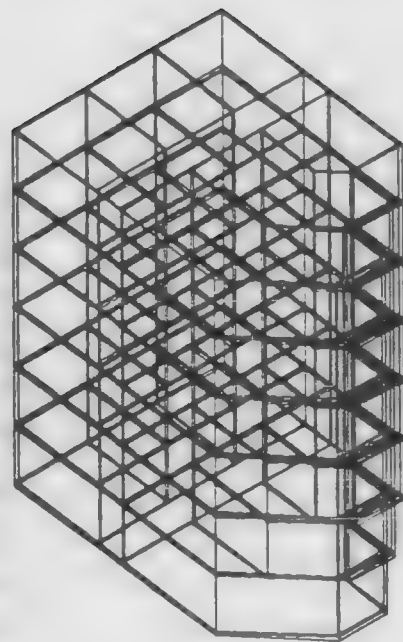
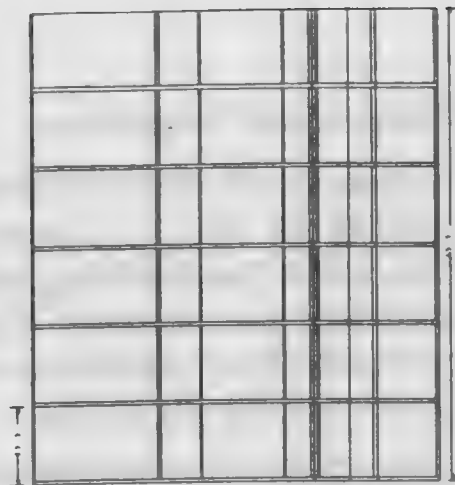
☐ Resize Duplicate(s)
☐ Rotate Duplicate(s)

Offset

X Offset:
Y Offset:

☐ Next Mouse

This creates a six story building with a slab between floors but no roof. Select all the floors and group them. Then in "3D View" select "Rotate: On Screen." Depress the mouse button and move the cursor diagonally from top-right toward bottom-left on the screen and the object will rotate, redrawing the building outline on the screen (or use the "Rotate..." dialog box as before).



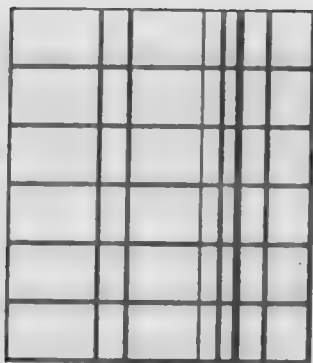
Render the building as you did before. By moving the Sun icon around you can change the shading on the surfaces.

Normal renders are done at the angle that an object is rotated on the screen.

Set Perspective



MiniCad+ uses the Sun icon and two others (the Man and Camera icons) to make perspective drawings. These icons automatically appear on the screen when "Set Perspective" is selected under the "3D Creation..." popup menu, and work together to allow you to set distance, angle, and the direction of the light source. Click on the top icon (the Sun) and move it away from the others. Click on the next icon (the Man) and move it away from the last icon, which is the Camera. Use the Camera icon to aim at the Man icon. This renders any selected

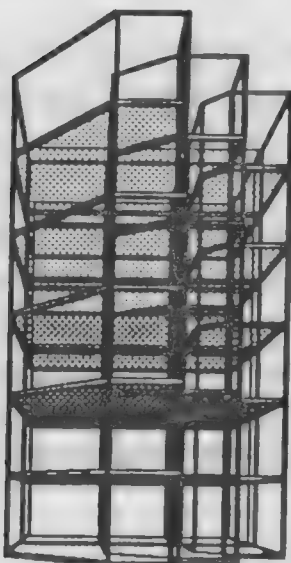
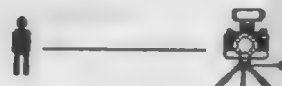


object in the focal path. The placement of the Man icon vis-a-vis the building determines the angle of perspective (i.e., placing the Man icon at the base of the building results in a street-level view). The distance of the Camera icon from the Man icon determines the size of the perspective (i.e., the closer the Camera icon is to the Man icon, the larger the finished rendering will be).

Be sure to check the placement of the icons in at least two views. In "Front View" place the Sun above the building. Line up the Man and Camera icons with the base of the building.



From the "Top View" you set the Sun icon behind and to the right of the building. Set the Man and Camera icons to the right of the building.



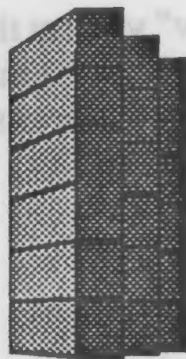
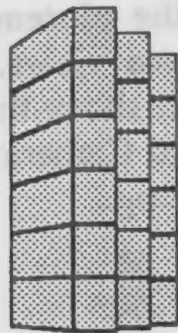
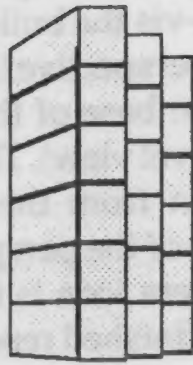
Now select the building and select "Render" from the "3D Creation..." popup menu. Select both "Perspective" and "Shading." Click the OK button. The picture to the left is the first perspective you'll get. Since only solid objects (i.e., 2D polygons that have been assigned a fill) can be shaded, only the floor slabs receive shading. The walls were made from lines which do not have a fill pattern. In this way it is

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possible to create perspectives which shade only parts of a building, allowing it to be viewed as it would appear during different stages of construction.

Notice that the first render is a picture of how the superstructure would look if you were standing where the Man icon stood before taking the shot. You are looking directly into the first floor, seeing the top of the base slab and the bottoms of the slabs above you.

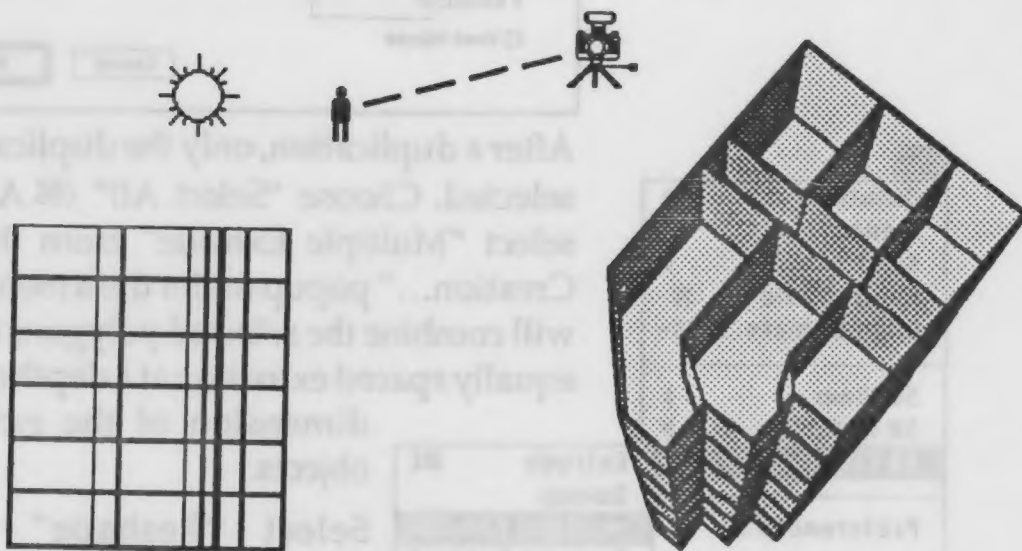
To render a perspective of the walls, select the building and then select a fill pattern. Again select "Render" and click both the "Perspective" and "Shading" buttons.

This time all the walls are rendered. Since the Sun icon is shining directly toward the building at the same angle as the shot is being taken, the fill shading is light. Moving the Sun icon to different angles and rerendering the drawing alters the shading.

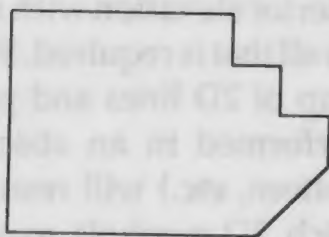
The perspective of the building appears as it would if you were looking up from the building's base.

"The MiniCad+ package is an excellent modeling tool because it works as fast as a person thinks. This meant dramatic time savings on the job, because computer modeling can be done two to 10 times as fast as physical modeling. And the time savings in generating perspective drawings are even more dramatic. In the time it takes to produce one presentation drawing by hand, we can generate six or more on the computer and these can be printed in a variety of sizes and media." AES

Changing the angle of perspective in the "Front View" so the camera is looking down on the building results in a perspective like the one below.



Another way to create the extrusion of the building is first to combine the outline of the building into a surface and use Multiple Extrude. This is useful for creating 2D elevation drawings.



Select the lines that comprise the exterior walls of the building in the file, "Basic Floorplan." Copy the selected lines (⌘C). Create a new file (⌘N) and scale the new file to 1 : 96. Paste the copied lines into the new file (⌘V). Select "Combine Into Surface" from the Tool menu, move the cursor inside the building outline, and click the mouse button. The lines will be converted into a polygon.

While the polygon is selected, select "Duplicate Array." Type the number "6" in the "Copies:" box. Click the OK button. Since the X and Y offsets are both set to 0', the six copies will be placed directly on top of the original.

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Duplicate

Copies:

Alteration

☐ Rectangular Array
☐ Circular Array

Offset

X Offset:
Y Offset:

☐ Next Mouse

☐ Resize Duplicate(s)
☐ Rotate Duplicate(s)

Δ

Rotate ▶
Move... %M
Send ▶
Align to Grid %-
Align Objects... %-

3D View ▶
3D Objects ▶
3D Creation ▶

Preferences...

Lock
Unlock

Extrude %E
Sweep
Multiple Extrude
Convert To Mesh
Convert To 3D
Render...
Set Perspective

Reshape

Size:

Height:

Width:

Depth:

After a duplication, only the duplicates are selected. Choose "Select All" (⌘ A), then select "Multiple Extrude" from the "3D Creation..." popup under the Δ menu. This will combine the selected polygons into an equally spaced extrusion at a depth of the X dimension of the extruded objects.

Select "Reshape" (⌘ R). Change the depth to 60'. The 3D object that appears after redraw is different from the extrusion you created earlier.

This is the outline of the building only, without superstructure or floor slabs.

Many times an exterior elevation with windows and doors is all that is required. Since a render is a group of 2D lines and polygons, renders performed in an absolute view (i.e., top, bottom, etc.) will result in elevations to which 2D symbols may be attached.

Conclusion

Now that you have worked through the tutorial, you should have a taste of the possibilities of working in MiniCad+ 3.0. Aside from the depth of its individual components, MiniCad+'s real strengths lie in its interactive nature. You can move back and forth with great fluidity between 2D, the database and worksheet, and 3D, using all these tools at once to complete an entire project. You can use the screen hints or turn them off. Further, although not discussed in the tutorial, MiniCad+ ships with a complete programming language that allows the experienced user to add even greater and more specialized power to MiniCad+.

The more you use MiniCad+, the more you'll be accustomed to working with all its sections together. In turn, you'll discover more and more sophisticated methods to combine tools to realize gains in productivity and quality in your work. We hope that you use this tutorial as a springboard from which you can venture out on your own. If you are a MiniCad+ owner, please refer to our reference manual or call technical services at 301-461-9488 for more detailed help. If you are a demo owner, please call us or your local dealer today to get more information or to order MiniCad+.